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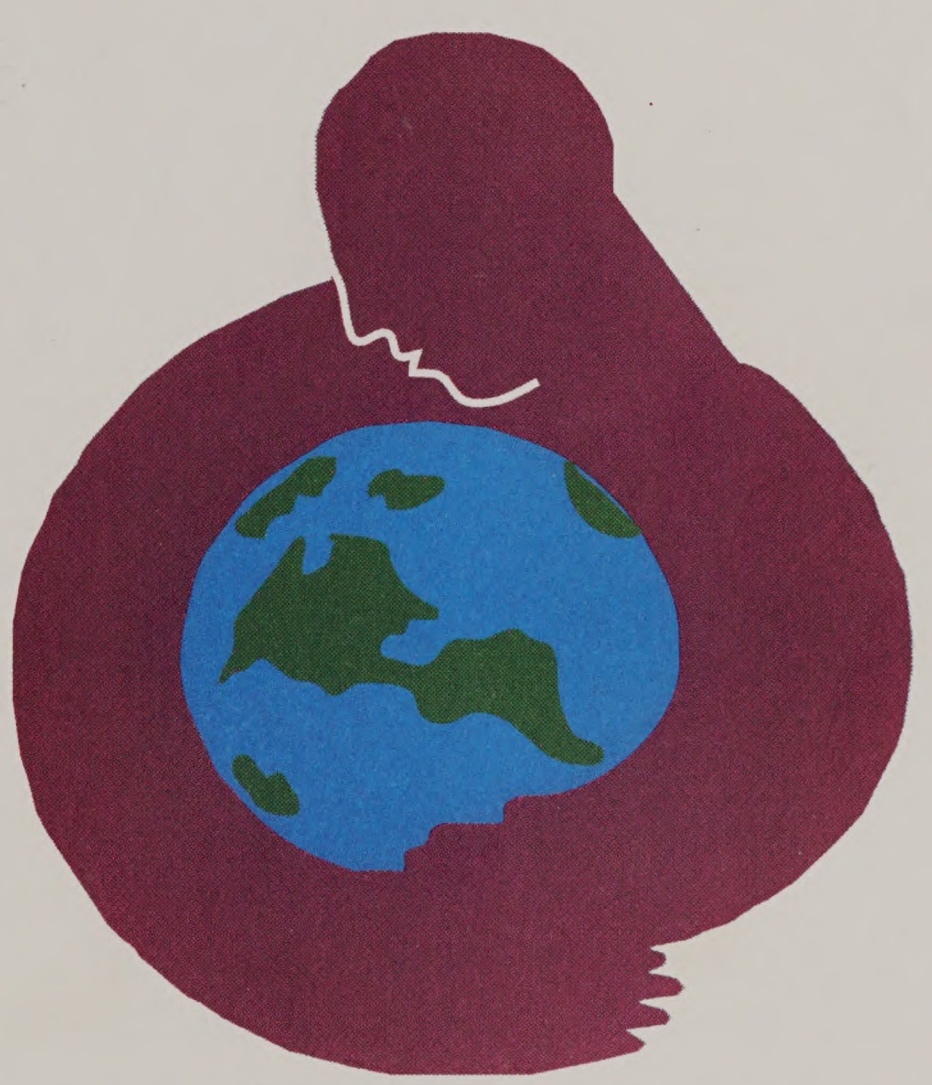
Social Sciences Institute

Technical Report

Industrialization of Agriculture: Trends, Spatial Patterns, and Implications for Field-Level Application



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Industrialization of Agriculture: Trends, Spatial Patterns, and Implications for Field-Level Application by the Natural Resources Conservation Service

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Technical Report 5.2

to the

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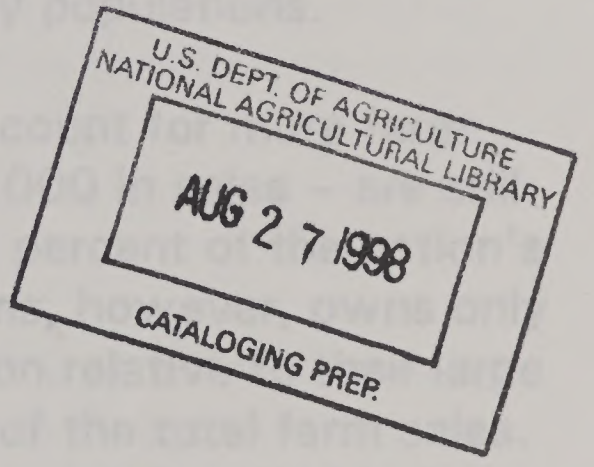

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Industrialization of Agriculture: Trends, Spatial Patterns, and Implications for Field-Level Application by the Natural Resources Conservation Service

Executive Summary

Agriculture has moved quite rapidly to a consolidated structure of fewer, larger farms, ranches, and animal feeding units. Driven by economies of scale arising from steady advances in technology, the trend shows no sign of slowing. During the past two decades, the number of farms in the nation has shrunk by roughly a fourth to about two million. This report examines the connections between industrialized agriculture and the population characteristics of rural counties. We treat the presence and numerical expansion of farms in the largest agricultural census categories as *prima facie* evidence of industrialization. The data analysis identifies counties where large livestock and poultry farms are present, where the number of such farms has increased in the past decade, and where such counties coincide with rapidly growing, poor, and minority populations.

As the number of farms shrinks, larger farms account for more farm economic activity. Small farms – less than $10,000 in sales – are still by far the most numerous, comprising about 60 percent of the nation's two million farms. This large group of small farms, however, owns only about a third of all farm assets, a small proportion relative to their large number. Small farms generate only 11 percent of the total farm sales. Thus, most small farms can be described as "life-style" or "hobby" farms that rely primarily on off-farm income. In contrast, the far less numerous commercial farms account for most industry assets and sales.

Medium-sized farms comprise about a fourth of all farms, own about two-fifths of industry assets, and produce nearly a third of industry sales. Large farms – more than $250,000 in sales – represent only 15 percent of the total number of farms, but own more than a fourth of all farm assets and produce well over half of industry sales. The new structure features increased concentration of large-scale livestock and

specialty crop production in fewer, scattered pockets surrounding existing or emerging marketing and processing centers. Industrialization refers to the movement toward more direct production and marketing relationships between producers and processing. This trend is most fully advanced in the broiler industry. Under industrialization, processors attempt to secure a stable supply of a consistent product while exploiting the economies of scale in new production and processing methods. As production shifts to bigger firms and clusters around processing plants, the result is a further concentration of production

The most striking structural shift, however, is underway in the pork industry which appears to be following the path toward integration blazed by the broiler industry four decades ago. From 1978 to 1994, the top ten hog-producing states experienced a dramatic increase in consolidation. During this period, the inventory controlled by operations in the largest size category (500 or more hogs) increased from about 40 percent of the top ten states' inventory in 1978 to about 77 percent of this inventory in 1994. Also, the number of operations in the largest size category increased by about 30 percent, while the total number of operations decreased by about 63 percent.

Method

The United States county data examined here portray the coincidence of industrialized agriculture – the number and growth of large farms – with the presence of poor, minority, and rapidly growing populations. First, counties with more than ten farms in the largest size category in each industry are identified on U.S. county maps. Second, counties that have added more than ten farms in the largest size category between 1982 and 1992 are identified. Finally, changes in the industrialization of the various animal and forest industries are linked to the presence of poor and minority populations, as well as population change.

Maps show counties with more than ten large farms in each industry that are in the upper quartile of counties with Black, Hispanic, American Indian, and poverty populations, as well as in the highest category of 1980-92 population change. Industrialized forestry is described in terms

of the counties with the greatest number of industrial forest acres as estimated by U.S. Forest Service survey data. This approach identifies the major large-scale production areas across a number of animal and forestry industries. The coincidence of large-scale animal production with poor and minority populations is reflected in patterns that may stem from historical accident, labor needs of the industries, and other factors not determinable from the information presented here.

Main Findings

The hog industry is the most controversial animal industry at the present moment. Large concentrations of animals produce waste disposal and odor problems that often create widespread hostility in surrounding communities. Additional concerns have been raised about the connections between industrialized animal production and the well-being and continued viability of family farms. The maps presented here portray the location of clusters of large scale units as well as where the number of units have grown in the past decade.

The broiler industry continues to expand in the Southeast. The connections between concentrated production and the presence of poor and minority populations tended to be greater in the Southeast. Both the industry and the rural and population tend to be concentrated in this region. Layer production tends to be concentrated in a smaller set of counties, primarily in the Southeast. The coincidence of layer production and minority populations tends to be less than for other industries. Turkey production is mainly concentrated in the Southeast. A small number of turkey-producing counties have limited connections to poor and minority populations. Large beef units tend to be located in the Midwest and West. Counties with more large beef units tended to coincide with Hispanic populations, including those in Florida. Forestry production tends to be most connected to minority populations in the South, particularly in Southwest Alabama. Native American populations tend to be linked to forestry in some Western states, Minnesota, and Wisconsin. Subsequent research can detail the interactions between growth in large-scale animal production and impacts on poor and minority populations.

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Industrialization of Agriculture: Trends, Spatial Patterns, and Implications for Field-Level Application by the Natural Resources Conservation Service

Introduction

Industrialized agriculture and the challenges it presents for resource conservation and environmental management is the reason for this report and base book of U.S. county maps. In addition, the Executive Order[2] on Environmental Justice mandates that all Federal agencies consider the impacts of their programs on poor and minority communities. This first of two reports provides factual information about the spatial aspects of industrialization in various animal industries and in relation to environmental justice concerns. The second report will use case studies to provide recommendations to NRCS field staff on effective ways to work with large scale livestock producers.

Industrialized animal agriculture has been a public issue in a number of locales primarily, but not exclusively, over its environmental impacts. Odor, surface water quality, ground water quality, and the health impacts of animal waste have been concerns in rural areas across the country. Manure storage lagoon failures in North Carolina, Missouri, and other states have raised many questions about the sustainability of large-scale operations. Recent growth of swine operations near a minority community in Illinois has been a source of controversy.

We examine the connections between industrialized agriculture and the population characteristics of rural counties. We treat the presence and numerical expansion of farms in the largest agricultural census categories as *prima facie* evidence of industrialization.

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[2] Executive Order 12898 Of Feb. 11, 1994 (59 F.R. 7629, Feb. 16, 1994) Federal Actions To Address Environmental Justice In Minority Populations And Low-Income Populations.

The data analysis identifies counties where large livestock and poultry farms, ranches, and feeding units[3] are present and where the number of such farms has increased in the past decade. Although consolidation and industrialization have been long-standing trends, the recent acceleration in the growth and concentration of large farms presents significant challenges for natural resource management. These changes also have important social consequences. New forms of organization and control also present new opportunities and complexities for public agencies endeavoring to provide technical assistance in natural resource management to large-scale agricultural operations.

This report should be useful to those considering the impacts of industrialized agriculture on poor and minority populations. It also will be of interest to those concerned with the spatial distribution of large units as well as recent growth in large farm and forestry operations.

Objectives of the Report

The central objective is to provide county-based mappings of the industrialization of agriculture – specifically increases in hog rearing, beef cattle raising, poultry production, and timber cutting. Subsequent sections provide a context for understanding recent changes in the organization and structure of agricultural and forestry industries.

The United States county data examined here portray several aspects of the structure of various animal industries. First, counties with more than ten farms in the largest agricultural census size category in each industry are identified on U.S. county maps.[4] Second, counties that have added more than ten farms in the largest size category between 1982 and 1992 are identified. Finally, changes in the industrialization of the various animal and forest industries are linked to the presence of poor and minority populations, as well as population change.

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[3] Hereafter, farms.

[4] Specific measures are detailed in the Method section of this report.

Maps show counties with more than ten large farms in each industry that are in the upper quartile of counties with Black, Hispanic, American Indian, and poverty populations, as well as in the highest category of 1980-92 population change. Industrialized forestry is described in terms of the counties with the greatest number of industrial forest acres as estimated by U.S. Forest Service survey data.

Consolidation in Agriculture[5]

Agriculture has moved quite rapidly to fewer, larger farms. The largest farms in the United States, those with annual sales greater than $500,000 a year, are just 2.5 percent of all farms; yet they account for 40 percent of farm output (Drabenstott and Smith, 1996:4). An extensive literature on the topic finds at least partial support for a link between corporate-commercial farming and socioeconomic conditions (Goldschmidt, 1978; Labao, 1990; Labao, Schulman, and Swanson, 1993; Reif 1987).

A steady shift to fewer and bigger farms has been one of the most striking trends in agriculture during the past half century. Driven by economies of scale arising from steady advances in farm technology, the trend shows no sign of slowing. During the past two decades, the number of farms in the nation has shrunk by roughly a fourth to about two million. As the number of farms shrinks, larger farms account for more farm economic activity. Small farms – less than $10,000 in sales – are still by far the most numerous, comprising about 60 percent of the nation's two million farms. This large group of small farms, however, owns only about a third of all farm assets, a small proportion relative to their large number. Small farms generate an even smaller proportion – only 11 percent – of the industry's total sales. Thus, most small farms can be described as "life-style" or "hobby" farms that rely primarily on off-farm income.

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[5] It should be noted that this section and most of the introductory section is drawn nearly verbatim from the cited sources. This material is presented here as context for mapping of the coincidence of industrialized agriculture with certain social and demographic variables.

In contrast, the far less numerous commercial farms account for most industry assets and sales. Medium-sized farms comprise about a fourth of all farms, own about two-fifths of industry assets, and produce nearly a third of industry sales (Barkema and Drabenstott, 1996:62-65).

The disparity between farm numbers on one hand and the proportion of industry assets and sales on the other is even greater for large farms. Large farms – more than $250,000 in sales – represent only 15 percent of the total number of farms, but own more than a fourth of all farm assets and produce well over half of industry sales. Thus, the steady process of farm enlargement has concentrated economic activity in the farm sector into a relatively small set of commercial-sized farms (Barkema and Drabenstott, 1996:62-65).

Agriculture Is Industrializing

Accompanying the decades-long trend to fewer, larger farms is another more recent structural shift in agriculture. This new shift in the industry's structure – often called "industrialization" – is tightening the industry's marketing links, creating a more integrated industry from farm to grocery. The hallmark of the industry's emerging structure is a shift toward contract production and vertical integration.

Vertical integration is a pattern of organization where various stages of the production process – genetics, feed, grow-out, processing, and distribution – are controlled by a single firm. These new systems are linking farmers, food processors, breeding companies, and other agribusinesses and are changing the way the industry does business in a fundamental way (Barkema, 1993;Barkema and others,1991).

As the food marketing system evolves, it is bypassing the traditional marketing system and shifting toward contract production and vertical integration. Farmers growing animals under contract utilize facilities, feeding, and management strategies prescribed in detail by the integrator or contracting firm. The key feature of the new marketing schemes is the establishment of rigid production guidelines to help ensure that raw food products will meet food processors' and ultimately

consumers' more stringent demands (Barkema and Drabenstott, 1996:62-65).

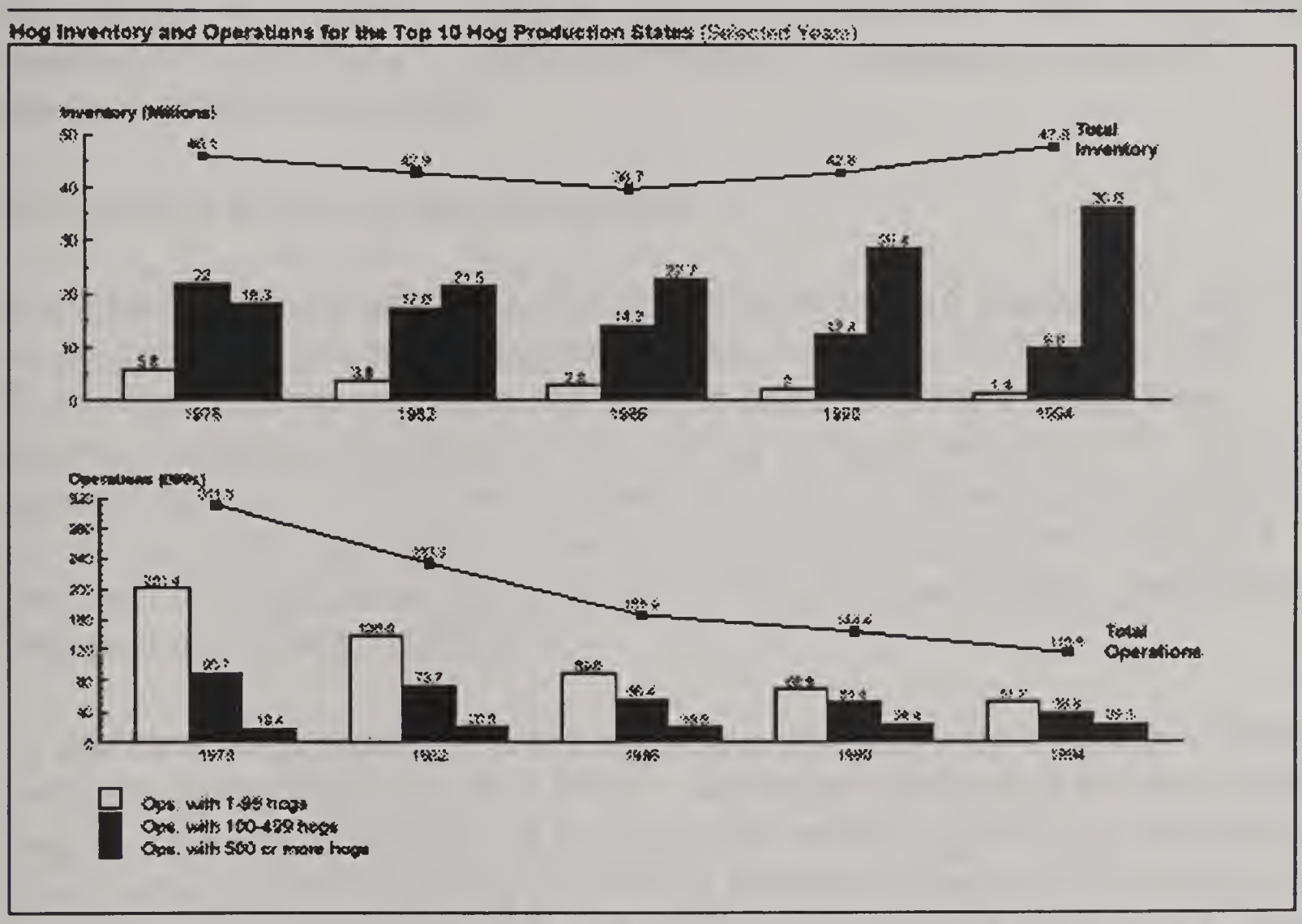
The extent of contract production and integration varies widely in agriculture. In animal production, the trend is most advanced in poultry production; for crops in vegetable production and specialty items such as popcorn. In contrast, relatively little wheat and feed are produced under contract or integration. The proportion is rising with increased production of specialty product grains, like white corn grown for tortilla chips. The proportion may rise further as farmers respond to a likely decline in government support for traditional crops (Barkema and Drabenstott, 1996:62-65).

Larger farms are the most likely to benefit from contractual arrangements to produce specialized products for food companies. The industry's new structure will link these farms more closely to the growing market for value-added food products. In contrast, smaller farms may face a declining market for their generic production. At best, they may become residual suppliers to the specialty product market. Thus, a more industrialized agriculture promises to add momentum to the long-standing shift toward fewer, larger farms. The industry's new structure points to increased concentration of large-scale livestock and specialty crop production in fewer, scattered pockets surrounding existing or emerging marketing and processing centers (Barkema and Drabenstott, 1996:62-65).

Nature of Industrialization

Industrialization refers to the movement toward more direct production and marketing relationships between producers and processing. This trend is most fully advanced in the broiler industry. Under industrialization, processors attempt to secure a stable supply of a consistent product while exploiting the economies of scale in new production and processing methods. As production shifts to bigger firms and clusters around processing plants, the result is a further concentration of production (Drabenstott and Smith, 1996:4).

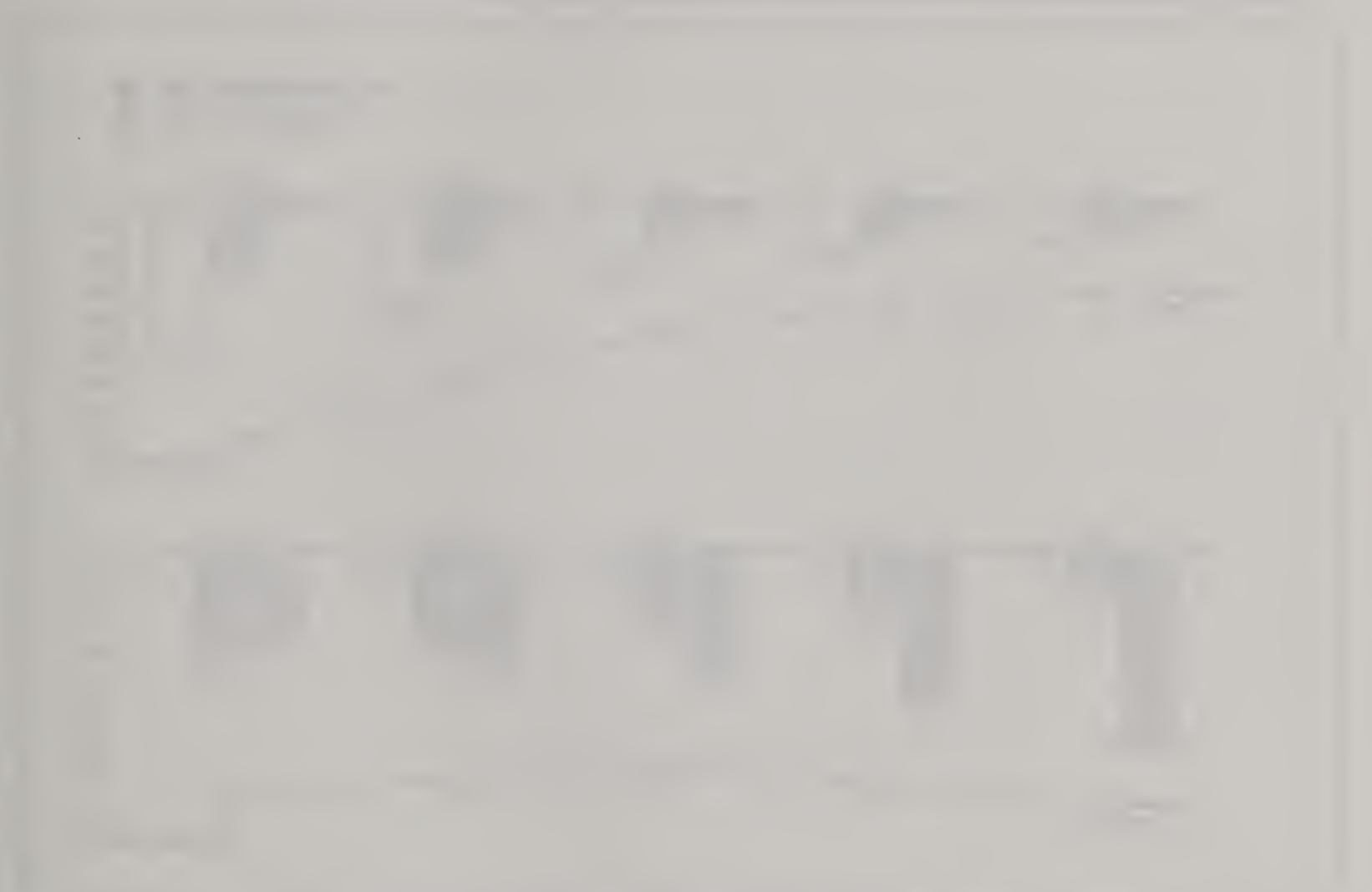
The most striking structural shift, however, is underway in the pork industry which appears to be following the path toward integration blazed by the broiler industry four decades ago. The structural shift in the pork industry is having a profound effect. Huge new integrated production units are developing in traditional pork states, such as Iowa, Missouri, and Minnesota, as well as in states that previously produced relatively little pork, such as North Carolina, Colorado, and Oklahoma (Barkema and Cook. 1996; Barkema and Drabenstott, 1996:62-65).



Note: The table shows inventory and operations for the top 10 production states in 1978; data for subsequent years is for the same 10 states. The actual top 10 states in 1994 differed from the top 10 states in 1978 by only one state. (See also, pp. 44-45.)

Source: ERS analysis of NASS data.

From 1978 to 1994, the top ten hog-producing states experienced a dramatic increase in consolidation. During this period, the inventory controlled by operations in the largest size category (500 or more hogs) increased from about 40 percent of the top ten states' inventory in 1978 to about 77 percent of this inventory in 1994. Also, the number of operations in the largest size category increased by about 30



percent, while the total number of operations decreased by about 63 percent.[6]

Because of the strong consolidation trend in the hog sector, the USDA introduced a new size category in 1988 (1,000 or more hogs). It then split this category into two categories in 1993 (1,000 to 1,999 and 2,000 or more hogs) to track production associated with large operations. From 1988 to1994, the inventory controlled by operations with 1,000 or more hogs increased from about 36 percent of the top ten states' inventory in 1988 to about 56 percent in 1994. Also, the number of operations in this size category increased by about 31 percent (GAO, 1995:43).

Geographic Shifts in Hog Production

A number of geographical shifts in the level of hog production occurred among the top ten hog-producing states between 1978 and 1994. North Carolina moved from seventh to second place among these states, increasing its share of the nation's hog inventory from about 4 percent to about 12 percent. Minnesota also experienced an increase in its share of this inventory, moving from about 7 percent to about 8 percent. South Dakota joined the list of the top ten states, and Georgia dropped out (GAO, 1995:45).

In addition, hog production fell slightly in the Corn Belt states – Illinois, Indiana, Iowa, Missouri, and Ohio – although nearly half of the nation's hog production continued to be centered in this region. For example, Iowa remained the top hog-producing state; its share of the nation's inventory dropped from about 25 percent in 1978 to about 24 percent in 1994. Illinois and Missouri also experienced slight reductions. According to USDA and industry sources, the strong consolidation trend in the hog industry is a factor in both North Carolina's emergence and the Corn Belt's decrease (GAO, 1995:45).

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[6] While the USDA reports total hog operations and inventory data for all 50 states, it does so by size-of-operation categories for the top ten hog production states only. From 1978 to 1994, the total number of operations (of all sizes) decreased by about 67 percent—from 635,000 to 209,000—while national inventory remained virtually the same at about 60 million head. (GAO, 1995:41)

North Carolina has a tradition of consolidated poultry production. Pork producers in this state have modeled themselves after the consolidated poultry sector. A main feature of this model is close business ties between producers and processors (slaughtering and packing plants). The result has been a rapid growth in the number of large hog confinement operations in North Carolina. An industry source also cited North Carolina's proximity to large consumer markets in the East and mild climate as other reasons for this state's hog production gains(GAO, 1995:45).

In contrast, the Corn Belt has a strong tradition of family farm hog production. This region has experienced significant public opposition to the growth of these operations. Hog industry sources generally believe that the consolidation trends in the hog sector are likely to continue over the next few years (GAO, 1995:45).

Other Industries

Broilers

From 1974 to 1992, the broiler sector experienced a steady increase in consolidation. During this period, sales attributable to operations in the largest category (500,000 or more broilers sold) increased from about 70 percent of national sales in 1974 to about 97 percent in 1992. The number of operations in the largest size category increased by nearly 67 percent, while the total number of operations (of all sizes) decreased by about 24 percent (GAO, 1995: 51).

From 1974 to 1992, the top ten states in broiler sales remained the same, with only minor fluctuations in their percentage of sales. While Virginia gained about one percent of the nation's sales, Arkansas, Delaware, and Maryland each lost approximately one percent; Texas lost about one-half percent (GAO, 1995: 51).

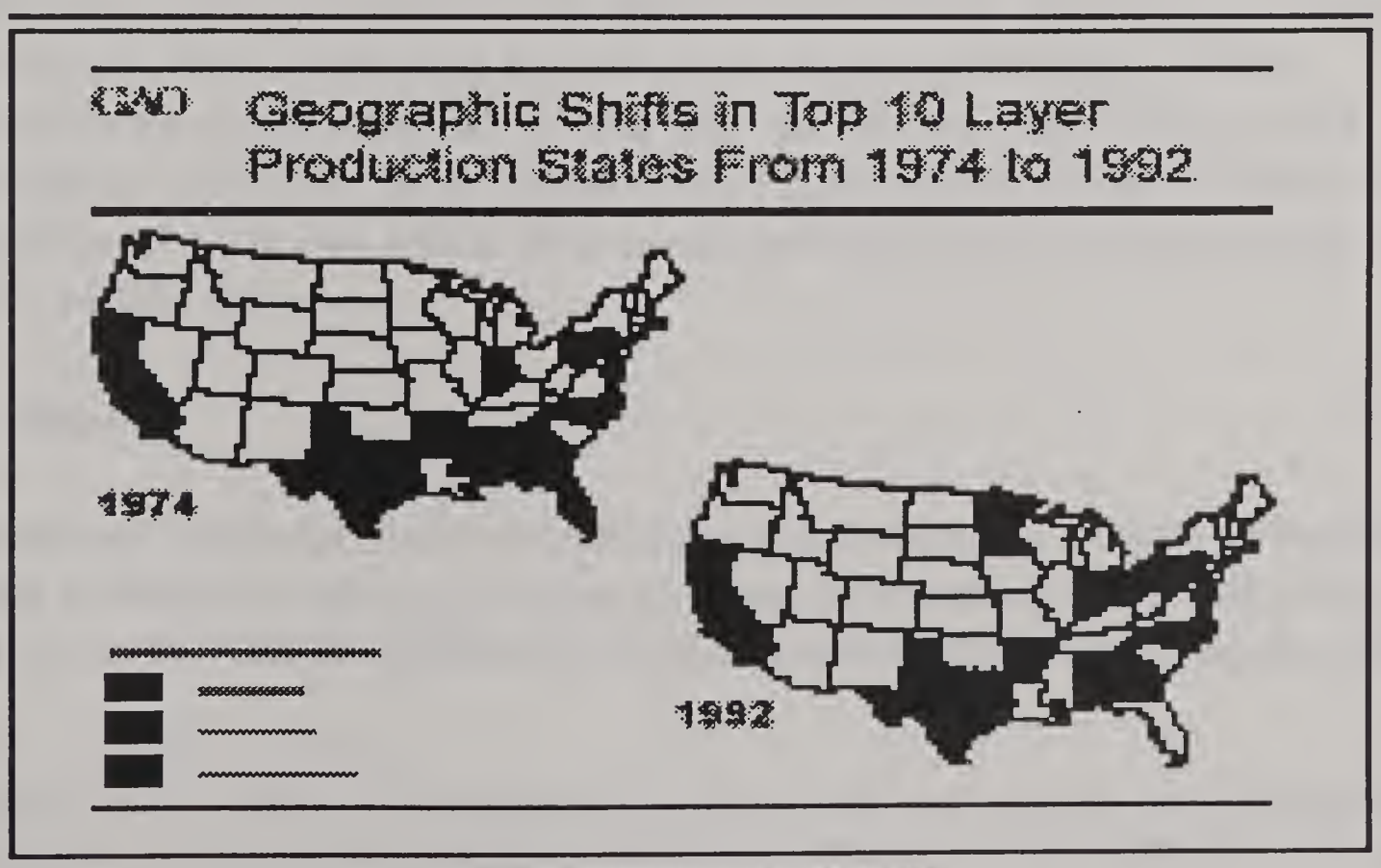
Broiler production developed and expanded in the Southeast because of this region's relatively low production and processing costs. For example, broiler housing costs are lower in the Southeast because of its

warm climate. Processing costs are lower because of the region's relatively low labor costs. In addition, the Southeast has a strong infrastructure to support the broiler industry (GAO, 1995: 49).

Layers

The layer sector experienced increased consolidation from 1974 to 1992. During this period, the inventory controlled by operations in the largest category (100,000 or more pullets and hens) increased from about 31 percent of national inventory in 1974 to about 62 percent in 1992. In addition, the number of operations in the largest category increased by about 50 percent, while the total number of operations (of all sizes) decreased by about 57 percent (GAO, 1995: 51).

From 1974 to 1992, Pennsylvania, Indiana, and Texas each increased its share of the nation's layer inventory by about one to 4 percent. Ohio and Minnesota also joined the list of the top ten layer states. California experienced the largest loss of inventory – about 4 percent – although it maintained its status as the leading layer inventory state; Mississippi and Florida dropped out of the top ten category. (GAO, 1995: 49).



New technology has caused some relocation of the industry for table egg production to the Midwest in order to be near grain-producing areas.[7] This technology includes the construction of large complexes (e.g., one million or more layers) that include both egg production and processing facilities. In addition, greater demand for egg products has resulted in construction of specialized facilities in the Midwest that produce dried, liquid, and frozen egg products for shipment across the nation. (GAO, 1995: 49).

Turkeys

From 1974 to 1992, the turkey sector experienced an increase in consolidation. During this period, sales by operations in the largest size category (100,000 or more turkeys sold) increased from about 43 percent of national sales in 1974 to about 60 percent in 1992. Also, the number of operations in the largest size category increased by over 200 percent, while the total number of operations (of all sizes) increased by 42 percent. (GAO, 1995: 53).

From 1974 to 1992, North Carolina moved from third to first place among the top ten states in turkey sales, increasing its share of national sales from about 11 percent to about 20 percent. Arkansas, Virginia, and Indiana also increased their shares of national sales, while Pennsylvania joined the list of the top ten states. California, Iowa, Minnesota, Missouri, and Texas each experienced a loss of about one to 3 percent of national sales. Wisconsin dropped out of the top ten group (GAO, 1995: 57).

Beef

In livestock markets, beef processors are turning to contract feeding to ensure a steady supply of cattle to keep processing lines operating. As a result, some cattle feeders who lack contractual relationships with

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[7] Wright County, Iowa, for transportation cost reasons, has some of the lowest grain prices in the State. It has experienced a large increase in poultry and egg production in the past decade.

processors complain that the market for their production has shrunk (Barkema and Drabenstott, 1990). Three companies control almost 80 percent of fed-cattle slaughter, along with an ever-increasing share of the cow/bull and pork market.

Market Power Issues[8]

In a 1995 article, *Successful Farming* magazine characterized the meat industry as a tangled web of horizontal and vertical integration. The largest players in the packing industry are expanding their hold on the market across species lines. The largest beef packer is also first in pork as well. The number two beef packer is likewise second in pork, and first by a wide margin in lamb. The third largest in cattle is sixth in hogs. These firms often extend the chain by adding packing facilities. On the other side, the third largest pork packer is now expanding into the production phase. Both trends are happening simultaneously.

Successful Farming magazine identified the 30 largest U.S. pork producers in 1995. These firms have a stronger bargaining position with meatpackers because of the large number of hogs they can deliver on a regular basis. The interviews provided some insight into their growth strategies and perhaps anticipate some ways that they will respond to environmental concerns.

Strong ties bind giant pork producers and packers, but there are different perspectives on how this relationship should be structured. One manager, whose company owns 34,000 sows, responded quite directly to the market power issue. "As much as some of the larger producers want to downplay the volume issue, the fact is, it is more economical for a packer to buy from a few large producers, ...I should expect a premium for volume. Volume is worth something to the packer. The head of a packing company can't afford to spend his day talking to a producer who sells the occasional gooseneck trailer of hogs. He can eliminate acquisition costs by buying from large producers."

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[8] This section is largely drawn from a September, 1995 web page *"Successful Farming* Exclusive: The 30 Largest Pork Producers in the U.S. and more." http://www.agriculture.com/contents/sf/porkpwr/

Of the 34 large producers (all with 10,000 or more sows), nine own at least a portion of a pork slaughter facility. Twelve others have long-term marketing agreements with a packer. Some of the agreements guarantee floor and ceiling prices, others simply promise kill space. In North Carolina, where ten of the top 34 producers reside, the typical contract promises a base price equal to the Iowa-southern Minnesota direct-to-plant price for that day. Grade and yield quality premiums are added to that.

For many reasons, 1995 produced a rush of large producers integrating with packers. As the hog market fell, interest rates rose and bankers encouraged many investor-driven producers to sign "risk-sharing" agreements that guaranteed a floor price. In some cases, packers jumped to fill kill quotas when competitors announced plans to move nearby. This happened in North Carolina when one large Midwest firm showed interest in building a plant near the North and South Carolina border.

Successful Farming contacted each of the largest producers and asked them what kind of marketing arrangements they worked under and why. For several large, integrated farms the answer is easy: They own the plants. A few other producers own a small portion of a packer. Most of the North Carolina producers have five- to ten-year contracts that guarantee kill space.

There are a few large producers who have no packer contracts. A Nebraska grower, (#12 on the list of 34, with 27,150 sows) falls into this category. "We take bids from five to eight packers every day. In the next few years we may have to form agreements with packers, but we have no price protection now. It is absolutely, positively an open market. The number one reason we won't consider signing these contracts is that we already get $2 or $3 above the Omaha top with the grade and yield premium... We sort well and sell lean hogs. And we sell every day."

"We need all packers to stay in business. We don't want to cut a deal with any one packer. We need local packers to bid on pigs. Some

producers are signing window contracts because the bankers are forcing them to... I don't want the packer to be my banker. I'm happy being unhedged with no contracts."

This philosophy is echoed by the head of one integrator's Iowa branch. "We sell pigs on a carcass merit basis to ... processors. We don't get a premium for volume – we get more because we have better pigs. We occasionally sell hogs to other packers to test out their carcass merit programs, but we aren't ready to be lined up with one packer." The contrast between marketing strategies is large.

With production in both Iowa and North Carolina, one large integrator knows the two markets. "The difference between North Carolina and Iowa is that there are fewer places to sell pigs in North Carolina," says the company's vice-president. "Producers there are anxious to have some sort of contract, whether it's written or oral, and there are both in Iowa." He adds, "markets continue to be plentiful as they kill far more pigs than the state raises." The manager recently moved to Iowa from the North Carolina headquarters. "We have no rigid plan for development here," he explains. "I am simply here to develop a healthy Midwest business."

At another industrialized grower, pigs are sold on a "prearranged-formula basis" to a processor. The manager says. "Shopping around is an inefficient way for us to do business. In our case we are paid for quality. The agreement is cancelable by either party on a day's notice, but it tends to be long term. We agree on a basis from which value is determined. There are no floor or ceiling prices and no prearranged pricing."

As a large-scale producer who expects volume-based premiums, another grower does not think much of the risk-sharing contracts that are currently popular. "If the buyer is going to protect the producer, the buyer needs to be compensated for that," he says. Our firm is "... in the business of taking risks. If we don't have the quality, we get discounted. "If you're going to get paid the same for good or bad hogs, there is no incentive to upgrade genetics. We tell the buyer: 'You pay us for quality and discount us for the absence of quality.' "

This grower makes no apologies for the trend toward fewer and larger pork producers. "Pork can't compete if it's not cost effective," he says. "History shows a dramatic lowering of cost to the consumer when an industry is integrated and in the hands of few large producers."

Successful Farming maintains that the trend toward concentrated production, slaughtering, and market power certainly shows no sign of stopping, despite market cycles. Some large producers have slowed expansion, but most are continuing. Even the manager at one firm, who stopped building when the market dropped, says, "when the market improves, we'll start to add sows again."

Of the 34 producers *Successful Farming* called in 1995, none had shrunk in numbers during the previous six months. What lower prices mean for North Carolina farms, maintains one producer, [is] "instead of adding 125,000 sows (all farms total) in 1995, they may only add 70,000."

Certainly the integrated producers who own slaughter facilities are not slowing down. One firm jumped from 65,000 to 70,500 sows since October 1994, with plans for more growth. "We are adding sows just as fast as we can put them in," says its vice president of corporate development. The firm is also signing up more producers to their long-term agreements, adding a 42,000 sow farm in late 1994. And the trend toward expanded integration with packers is assuredly not slowing.

Some slowing in expansion by the largest pork producers may be expected. For example, when the hog market fell in October 1994, another firm stopped all expansion of its 110,000-sow herd. "We retreated into a holding pattern at that point," says its president. "We had to finish any farm that was ready to populate, but if it was just being built we stopped construction."

Most other large operations in North Carolina went ahead and finished construction on farms they had underway, but did not schedule any new building. Of course, some of the large producers, especially those

owning slaughter facilities, continued to expand at full speed. "The market may have altered plans for some folks, but a company like us - we won't back off," says another integrator. "It hasn't changed anything [for us]. Production is 70 percent of the kill in our Missouri plant, and it will eventually be 100 percent," says the manager.

Pork producers are not immune to the bulge in farm-to-retail spreads. When the hog market fell to all-time real value (inflation adjusted) lows of $26.95 in late 1995, the farm-to-retail spread represented 77 percent of the final retail value. In other words, the farm share was just 23 percent! Between 1982 and 1995, the producer's share dropped 30 percent, and considerably more on an inflation-adjusted basis.

Beef producers get a substantially larger share of the retail dollar than pork producers. Beef producers do better than poultry producers, too. Earlier in 1995, broiler, turkey and egg producers were getting just 31 percent, 13 percent and 14 percent of the retail dollar, respectively.

The forces and trends fueling concentration, industrialization, and vertical integration have created a fertile breeding ground for distrust and suspicion. Distrust is fueled by the great and increasing concentration of the animal industries. Every major anti-trust law has been the result of packer concentration, and the previous levels of concentration that spawned governmental action were much lower than those which now exist. Left unchecked, concentration on one side of the market tends to foster concentration on the other side of the market. And concentration also may tend to foster adverse environmental impacts (USDA-AMS, 1996:5).

Forestry

Moulton and Birch (1995, 1996) recently completed an extensive study of forest land-ownership in the United States that followed-up on an earlier one from 1978. They reported that there are currently almost ten million private forest landowners in the U.S. This is an increase of 2.2 million owners (28 percent) over the 7.8 million estimated in the 1978 study. All regions of the country reported gains, but at different rates.

The 17-state West had the greatest percentage increase. The South, however, reported the most owners – 50 percent in each study.

Land ownership is concentrated among a few relatively large private landowners. In the South, five percent of all owners have tracts of 100 acres or larger. They collectively own 54 percent of the Southern forest land. In the West, fewer than seven percent of the owners have 100 acres more. This group owns about 84 percent of the West's private forest land.

In the South, 95 percent are classified as "individual owners." However, they collectively own only 61 percent of the forest land. In contrast, corporations (which represent forest product companies, mining companies, railroad, pension funds, etc.) represent only one percent of the landowners. This group owns 28 percent of the land. The remaining are classified as partnerships. The pattern of concentration is even more dramatic in the West. There, corporations represent only two percent of the landowners, but they control 39 percent of the forest land.

Murray (1995) discusses upstream (backward) integration in the forest products industry as characteristic of commodity markets where in there are only a few buyers for wood supplies as compared to a larger number of suppliers. This few buyer-many seller situation is found in the pulp and paper industries, which procure a substantial portion of their pulp wood from firm-owned forest lands (Murray 1995a:194). Murray references a number of other works which document this tendency in the pulp and paper industry as well as in the Douglas Fir timber market.

METHOD

Data for U.S. counties were obtained from the census of agriculture, census of population, and other data sources. County-based maps show the spatial distribution of the intersection of agricultural and socioeconomic characteristics. These data illustrate the extent to which clusters of large animal operations are distributed across the U.S. and

the extent to which such clusters coincide with the presence of poor, minority, and fast-changing populations.

The primary political divisions of most states are termed "counties." In Louisiana, these divisions are known as "parishes." In Alaska, the equivalent areas are the organized "boroughs." Four states – Maryland, Missouri, Nevada, and Virginia – have one or more incorporated places that are legally independent of any county and thus constitute primary divisions of their states.[9]

County Characteristics

Socioeconomic Variables

This study examines socioeconomic and industrialized agriculture characteristics of U.S. counties.[10] Each variables was recoded into three categories according to the county's particular standing in the statistical ranking of U.S. counties. The first category represented the highest 25

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[9] The District of Columbia is treated as a statistical equivalent of a State for census purposes. Federal Information Processing Standards (FIPS) codes are issued by the National Institute of Standards and Technology for a variety of geographical entities, including states, counties, metropolitan areas, and places. Each state and the District of Columbia is assigned a two-digit FIPS code. The five-digit FIPS county code is a sequential numbering, with some gaps, of the alphabetic arrangement of the counties within states, the first two digits of which are the State code. The 135 areas classified as county equivalents for the 1990 census include 14 organized boroughs and 11 census areas in Alaska; the District of Columbia; 64 parishes in Louisiana; Baltimore city, Maryland; St. Louis city, Missouri; the part of Yellowstone National Park in Montana; Carson City, Nevada; and 41 independent cities in Virginia.

[10] Previous research has endeavored to identify dimensions or structure in organization of agriculture using the county as a spatial unit of analysis. The geographer Gregor (1982) was one of the first researchers to take this approach. Wimberley (1987) undertook similar analysis using factor analytic techniques. Most recently, Thomas and colleagues (1996) used cluster analysis to identify areas of corporate-commercial farming.

percent of counties, the second the middle 50 percent, and the third the lowest 25 percent.[11]

Families Below Poverty Level is expressed as a percent of the 1990 total of families in the county. The three categories were: more than 16.1 percent; 8.3 to 16.1 percent; and less than 8.3 percent. These classifications mean that 25 percent of the counties had poverty rates higher than 16.1 percent; that 25 percent had poverty rates less than 8.3 percent; and the remaining 50 percent of the counties had rates in between.

Population Change between 1980 and 1992 population is expressed as a percent of the 1990 total population in the county. The three categories based on statistical quartiles were: more than 13.3 percent; minus 6 to 13.3 percent; and less than minus 6 percent.

Black population is expressed as a percent of the 1990 total in the county. The three categories were: more than 9.972 percent; 0.159 to 9.971 percent; and less than 0.159 percent.

Hispanic population (any race) population is expressed as a percent of the 1990 total. The three categories were: more than 2.5 percent; 0.4 to 2.5 percent; and less than 0.4 percent.

Native American – American Indian, Eskimo, and Aleut – population is expressed as a percent of the 1990 total. The three categories representing statistical quartiles were: more than 0.64 percent; 0.16 to 0.64 percent; and less than 0.16 percent.

Industrialized Agriculture Variables

Broilers. The number of farms selling more than 500,000 broilers per year – the largest size category in the agricultural census – is used to indicate industrialized broiler production. The level of industrialization is

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[11]All socioeconomic data were obtained from the University of Virginia Social Science Research Center http://www.lib.virginia.edu/socsci/ file of the U.S. Bureau of Census County and City Databook.

indicated by three categories: counties with more than ten large operations; counties with between one and ten large operations; and counties with no large operations.

The absolute difference between 1982 and 1992 in the number of operations of this size in a county is used to indicate **change in industrialization**. Three categories are employed: counties that gained more than ten broiler operations; counties that gained between one and ten broiler operations; and counties that added none or lost any.

Layers. The number of farms with inventories of more than 100,000 hens and pullets is used to indicate the presence of industrialized layer production. The level of industrialization is indicated by three categories: counties with more than ten large operations; counties with between one and ten large operations; and counties with no large operations.

The absolute difference between 1982 and 1992 in the number of operations of this size in a county is used to indicate **change in industrialization**. Three categories are employed: counties that gained more than ten large operations; counties that gained between one and ten operations; and counties that added none or lost any.

Turkeys. The number of farms with turkeys is used to indicate the presence of industrialized layer production. Turkey operations are not reported by size category in the agricultural census. The level of industrialization is indicated by three categories: counties with more than 50 operations; counties with between one and 50 operations; and counties with no operations with turkeys.

The absolute difference between 1982 and 1992 in the number of operations of this size in a county is used to indicate **change in industrialization**. As no size category is available in the census, all operations are included in this variable. Three categories are employed: counties that gained more than ten operations; counties that gained between one and ten operations; and those that added none or lost any.

Hogs. The number of farms with inventories of more than 1,000 hogs is used to indicate the presence of industrialized hog production. The level of industrialization is indicated by three categories: counties with more than ten large operations; counties with between one and ten large operations; and counties with no large operations.

The absolute difference between 1982 and 1992 in the number of operations of this size in a county is used to indicate **change in industrialization.** Three categories are employed: counties that gained more than ten broiler operations; counties that gained between one and ten broiler operations; and counties that added none or lost any.

Beef. The number of farms and the number of feedlots with inventories of more than 500 beef cattle were summed to indicate the presence of industrialized beef production. **The level of industrialization** is indicated by three categories: counties with more than ten large operations; counties with between one and ten large operations; and counties with no large operations.

The absolute difference between 1982 and 1992 in the number of operations of this size in a county is used to indicate **change in industrialization.** Three categories are employed: counties that gained more than ten broiler operations; counties that gained between one and ten broiler operations; and counties that added none or lost any.

Forestry. The data were recovered from the U.S. Forest Service's Forest Inventory and Analysis (FIA) online data base retrieval system.[12] For the counties of each of 44 states, the total number of acres classified as owned by "forest industry" was downloaded as a user-defined table. Data for 6 states had yet to made available by the time of this research. They are treated as zero acres for the purposes of mapping.

According to the FIA classification, lands legally owned by forest industry are defined as "Lands owned by companies or individuals operating wood-using plants. These include lands leased to forest industry." FIA procedures assign area expansion factors to plots in their

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[12] (http://www.srsfia.usfs.msstate.edu/scripts/ew.htm).

samples. Summation of all of these factors across plots classed as owned by forest industry in a given county yields an estimate of the total number of acres owned or leased by the forest industry for that county.

The number of production units with more than 53 acres of forest are used to indicate the presence of industrialized forestry production. This category identifies the upper quartile of all U.S. counties. The **level of industrialization** is indicated by three categories based on statistical quartiles: counties with more than 53 acres of industrial forest; counties with between 2.1 and 53 acres; and counties with less than 2.1 acres.[13] As no data were available for an earlier period, there is no indicator of **change in industrialization** in forestry for this report.

Coincidence Indicators

The **coincidence indicators** used in this study were developed by cross tabulating each three-level socioeconomic variable by each three-level industrialized agriculture variable. This resulted in nine categories of relationship between socioeconomic condition and level of agricultural industrialization. To facilitate interpretation, only five of the nine logical possibilities were shaded on the maps.

The nine categories were used to create county-based mappings of increased industrialization of agriculture showing how changes in the industrialization of hog, beef, poultry – broilers, layers, and turkeys, and timber industries are related to the spatial distribution of minority and socially disadvantaged populations[14]. The nine categories of gradation are used to graphically display the coincidence of the socioeconomic and agricultural industrialization indicators.

Code Values and Shading for Coincident Indicator Values

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[13] Counties with no forestry, or where FIA data were not available, were treated as zero acres in developing statistical quartiles.

[14] The formula for the nine categories typology was:
CATEGORY = SESVAR * (AGVAR + 6). This computation led to a unique value for each cell in the 3 x 3 table that then could be color-coded, assigned to each county, and mapped using Maplinx® computer software.

Category		Industrialization Level		
		No large farms	1 to ten large farms	11 or more large farms
Socioeconomic	Lower 25 percent	White – 7	White – 14	White – 21
Variable	Middle 50 percent	White – 8	Crosshatch – 16	Gray – 24
	Upper 25 percent	Yellow – 9	Light gray – 18	Black - 29

The maps show the individual counties – coded 24 or 27 – where high levels of minority or disadvantaged populations are co-located with larger numbers of industrialized animal production and industrial forestry. Where such coinciding counties are confined to a specific region of the country, only that portion may be displayed. Where only a few counties have high levels of disadvantaged populations and industrialized animal production and forestry, then the individual counties are labeled.

RESULTS

Socioeconomic Variables

Poverty. The map displays the distribution of poverty counties across the nation. The darkest shade identifies the quartile of poverty counties in the U.S. in excess of 16.1 percent of families in poverty. The gray counties represent the middle 50 percent of counties (more than 8.3 percent and less than 16.1 percent). The unshaded counties are the lowest quartile of counties with respect to the proportion of families (8.3 percent or less) in a county below the income level established to reflect poverty. Most poverty counties are in the South, Appalachia, and isolated portions of the West.

Population Change. The map identifies counties that have grown the fastest between 1980 and 1992 – more than 13.3 percent. Unshaded areas are those with population change rates greater than minus 6 percent. Population gain counties were largely in the West and South. The counties in the highest quartile of population change were found in nearly every state. Nearly all Florida and Arizona counties had high rates of growth. The lowest quartile of counties were largely distributed down the central portion of the nation and in some parts of Appalachia.

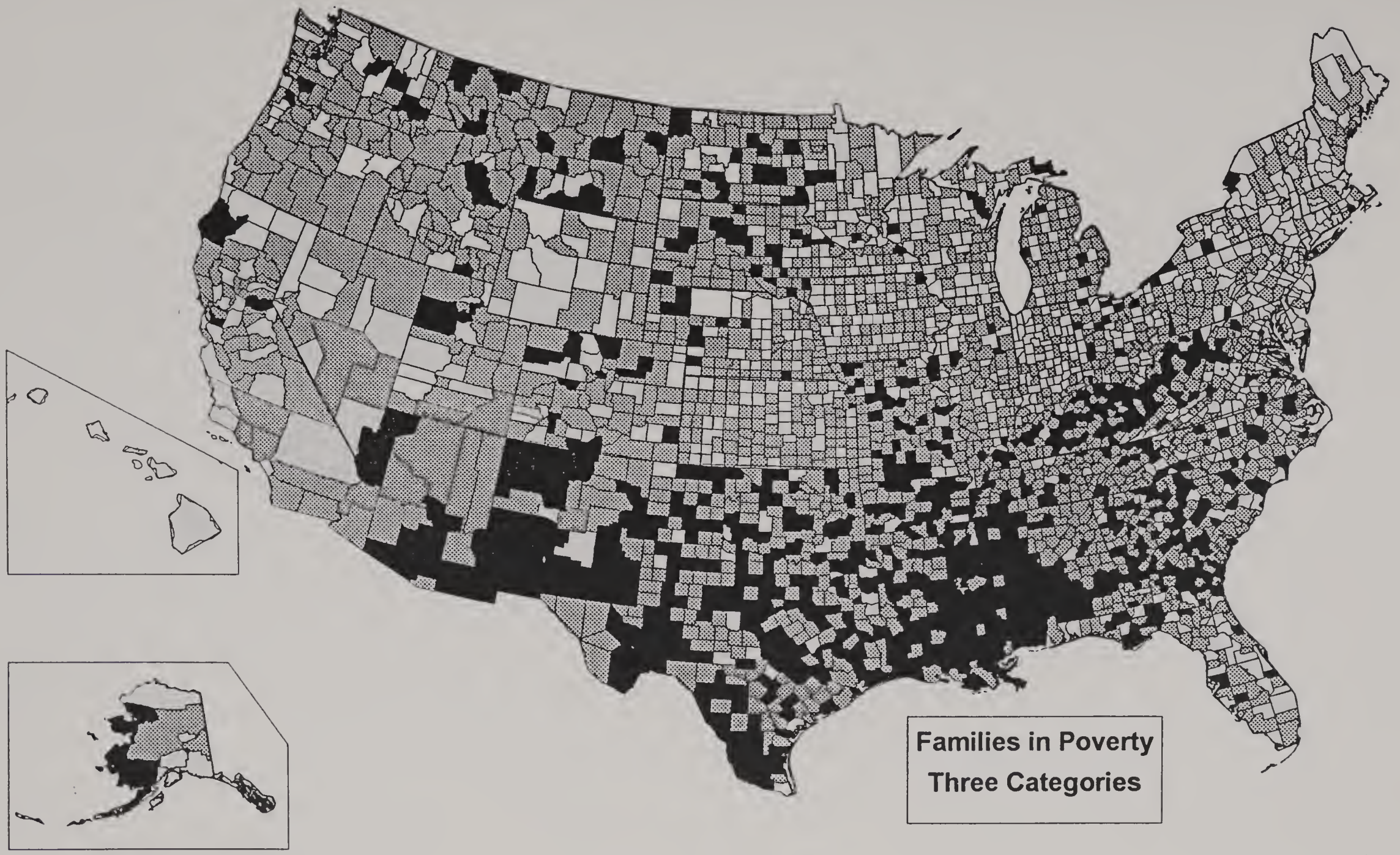
Black Population. Counties with and populations greater than 9.972 percent of the total are shaded and. The middle 50 percent of counties are shaded gray. Counties with less than 0.159 percent and are unshaded. The counties in the highest quartile of Black population is largely located in the Southeastern U.S.

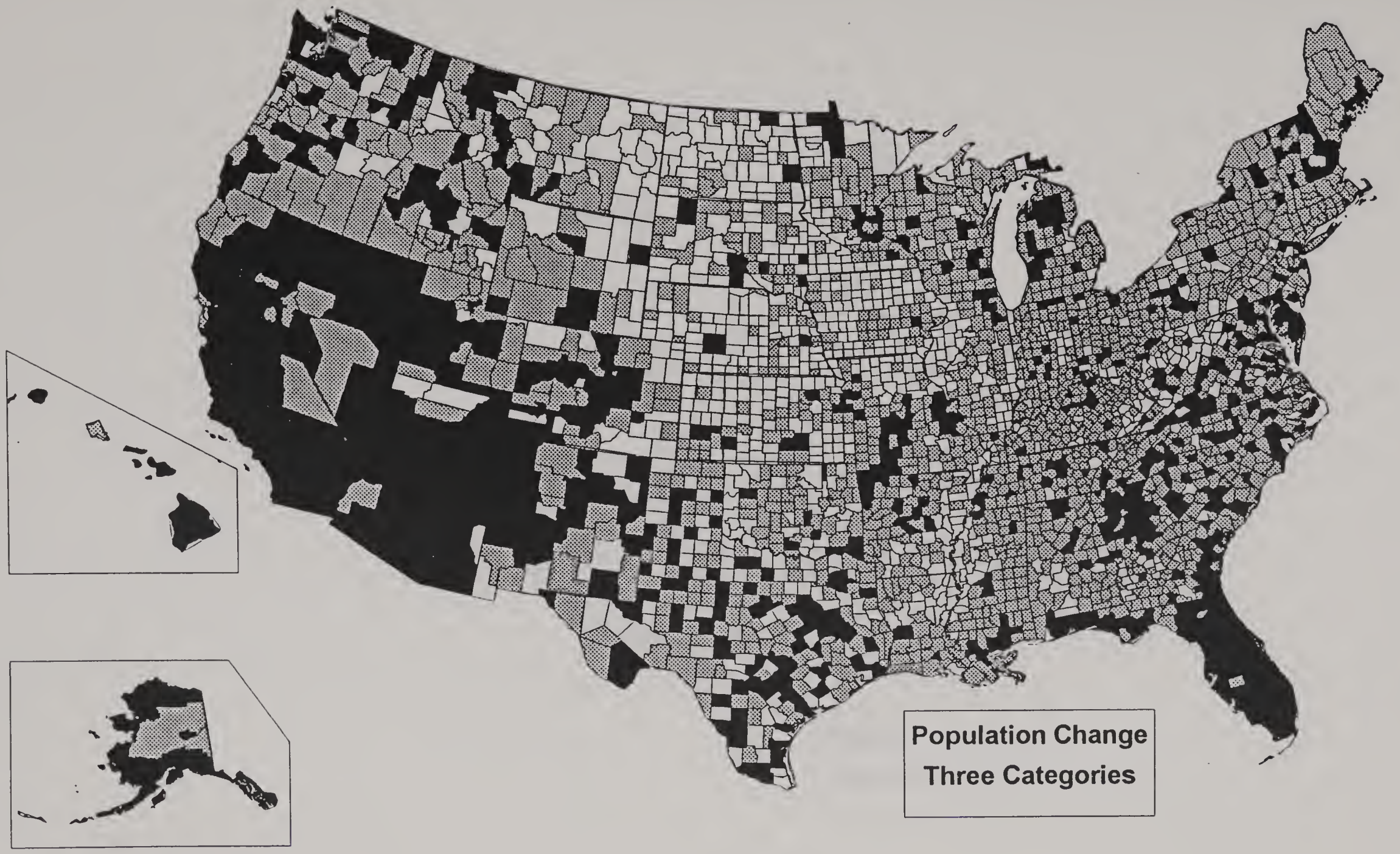
Hispanic Population. Counties with Hispanic populations greater than 2.5 percent of the total are shaded black. The middle 50 percent of counties are shaded gray. Counties with less than 0.4 percent Hispanic population are unshaded. The Hispanic population is largely found in the Southwest and Florida, though a number of New York counties were in the top quartile.

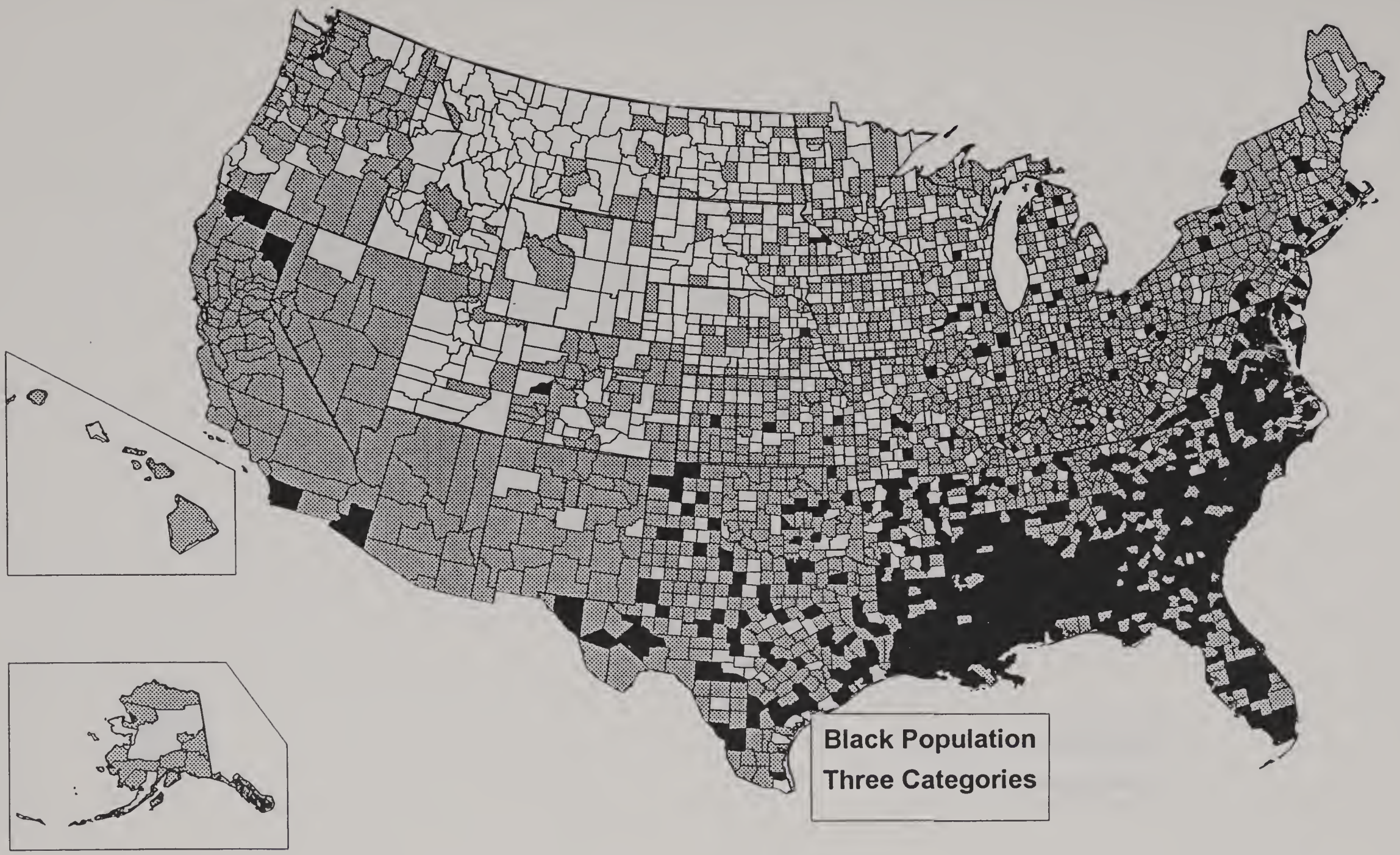
Native American Population. Counties with Native American populations greater than 0.64 percent of the total are shaded black. The middle 50 percent of counties are shaded gray. Counties with less than 0.15 percent Native American are unshaded. The West and some northern Midwest counties have higher proportions of Native American Population.

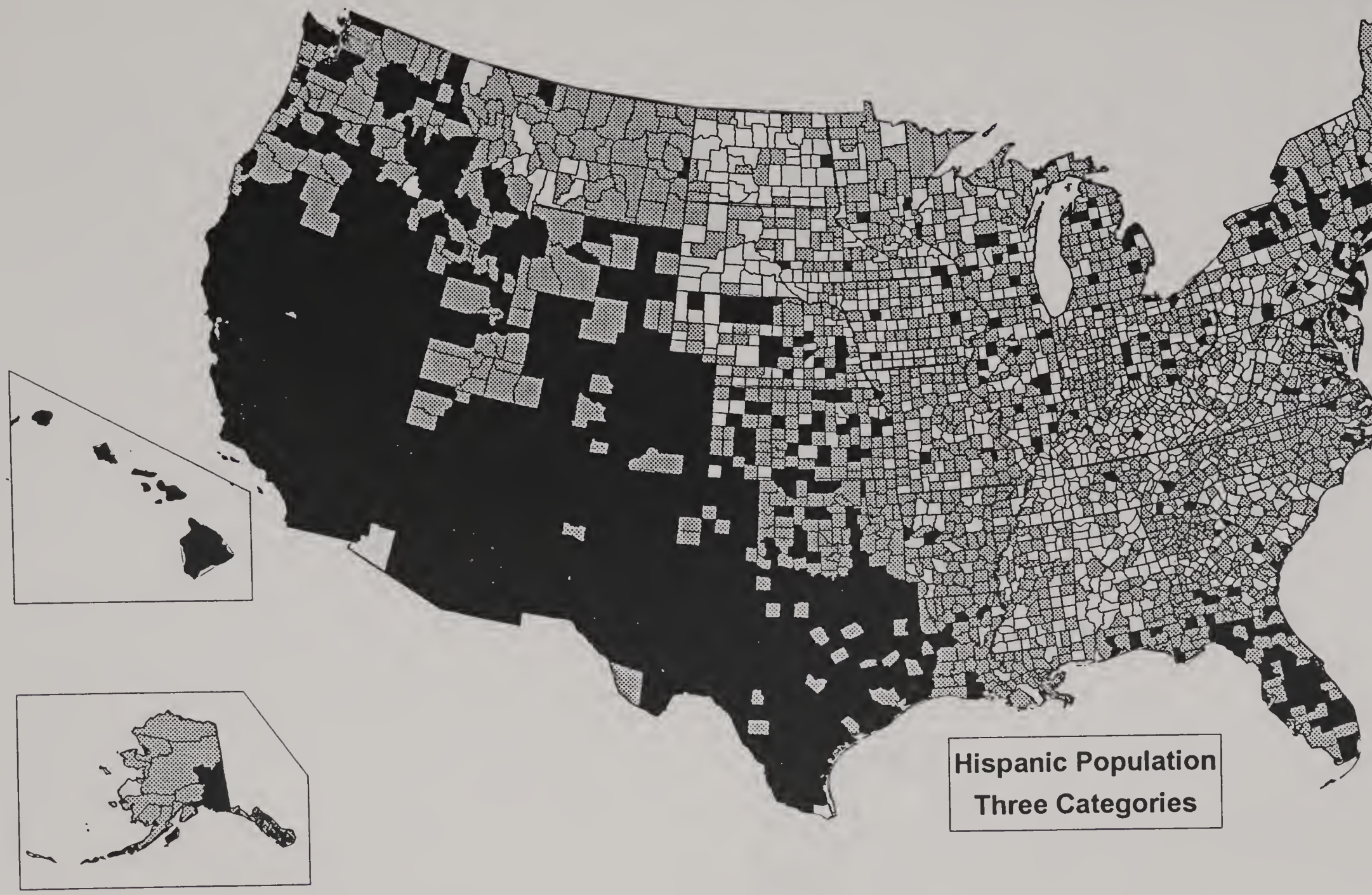
Map Shading for Socioeconomic Variables

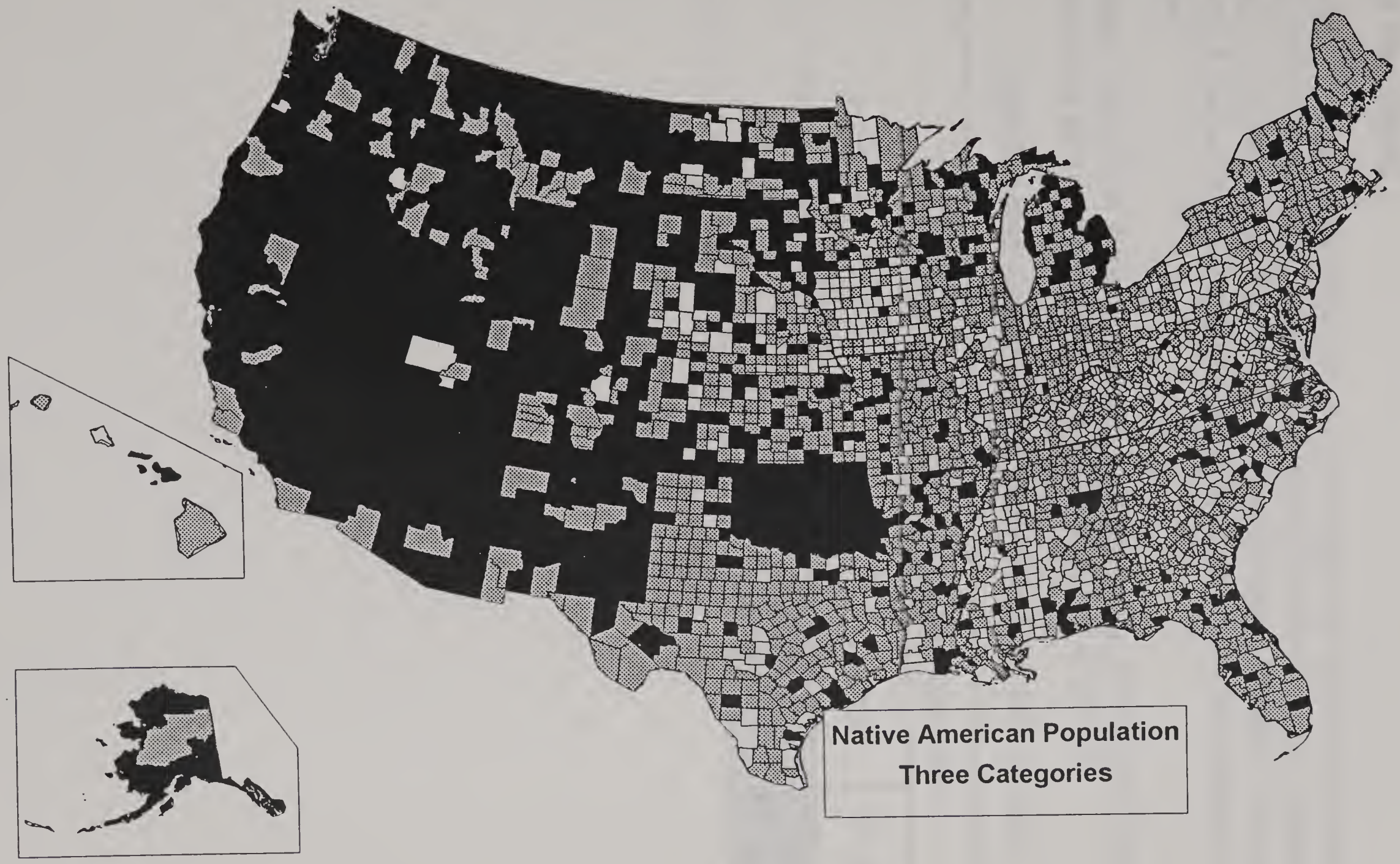
Category	Statistical Quartile of County		
	Lower 25%	Middle 50%	Upper 25%
Shading	Few	Some	Many


Families in Poverty
Three Categories


Population Change
Three Categories


Black Population
Three Categories


Hispanic Population
Three Categories


Native American Population
Three Categories

Industrialized Agriculture Variables

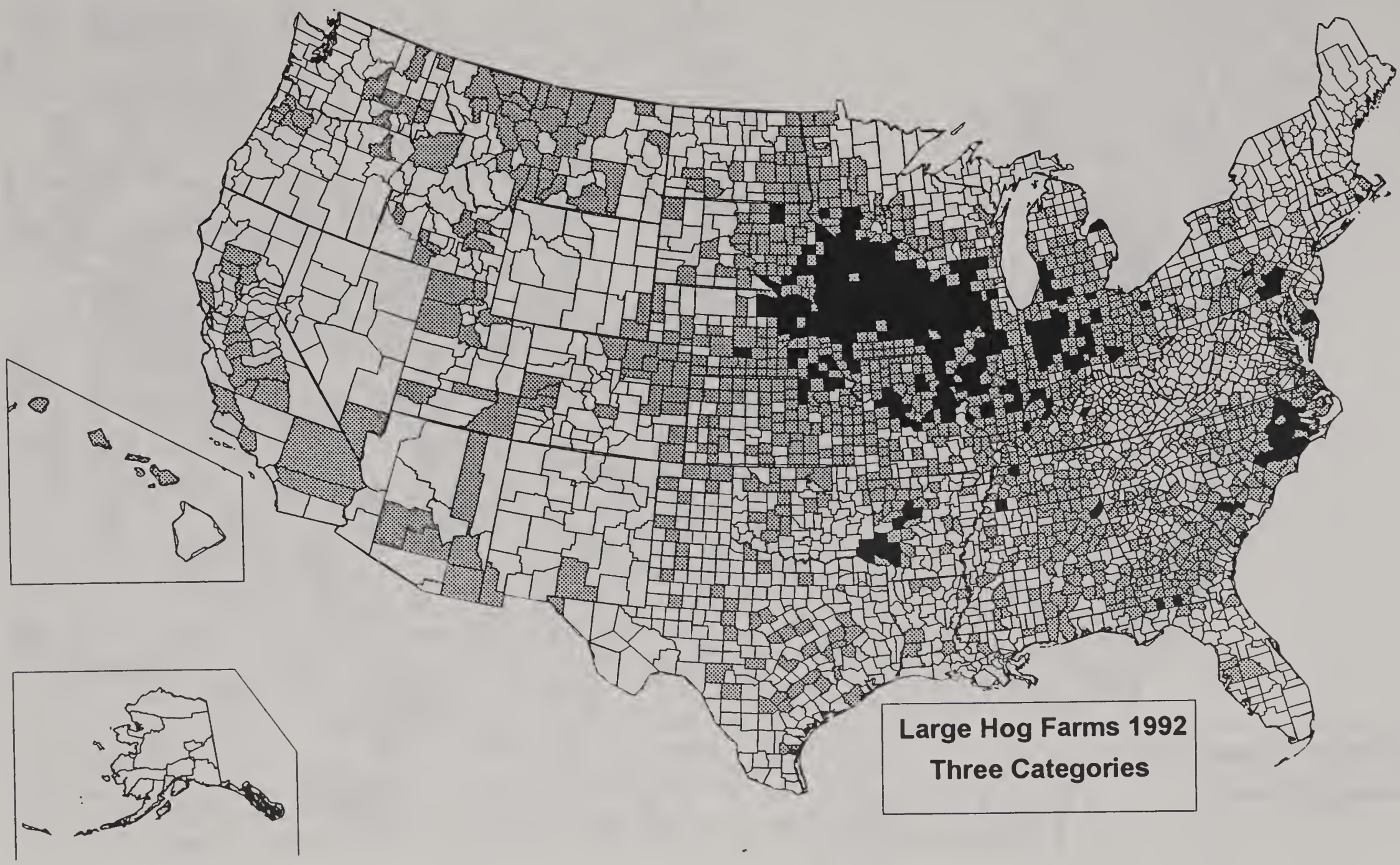
- **Large Hog Farms**

Number. The counties with ten or more large hog farms are primarily located in the central Midwest, and eastern North Carolina, though a cluster is found near the Arkansas-Texas-Oklahoma border. The diagram provided below summarizes the shading used in the two maps that follow.

Change. Growth in large hog farms was primarily confined to the three areas noted above, though in a smaller subset of counties.

Map Shading for Large Hog Farm Numbers and Change

Category	Large Hog Farms		
	None	1 to ten	11 or more
Shading	Few	Some	Many


Large Hog Farms 1992
Three Categories

'82-'92 Change Large Hog Farms
Three Categories

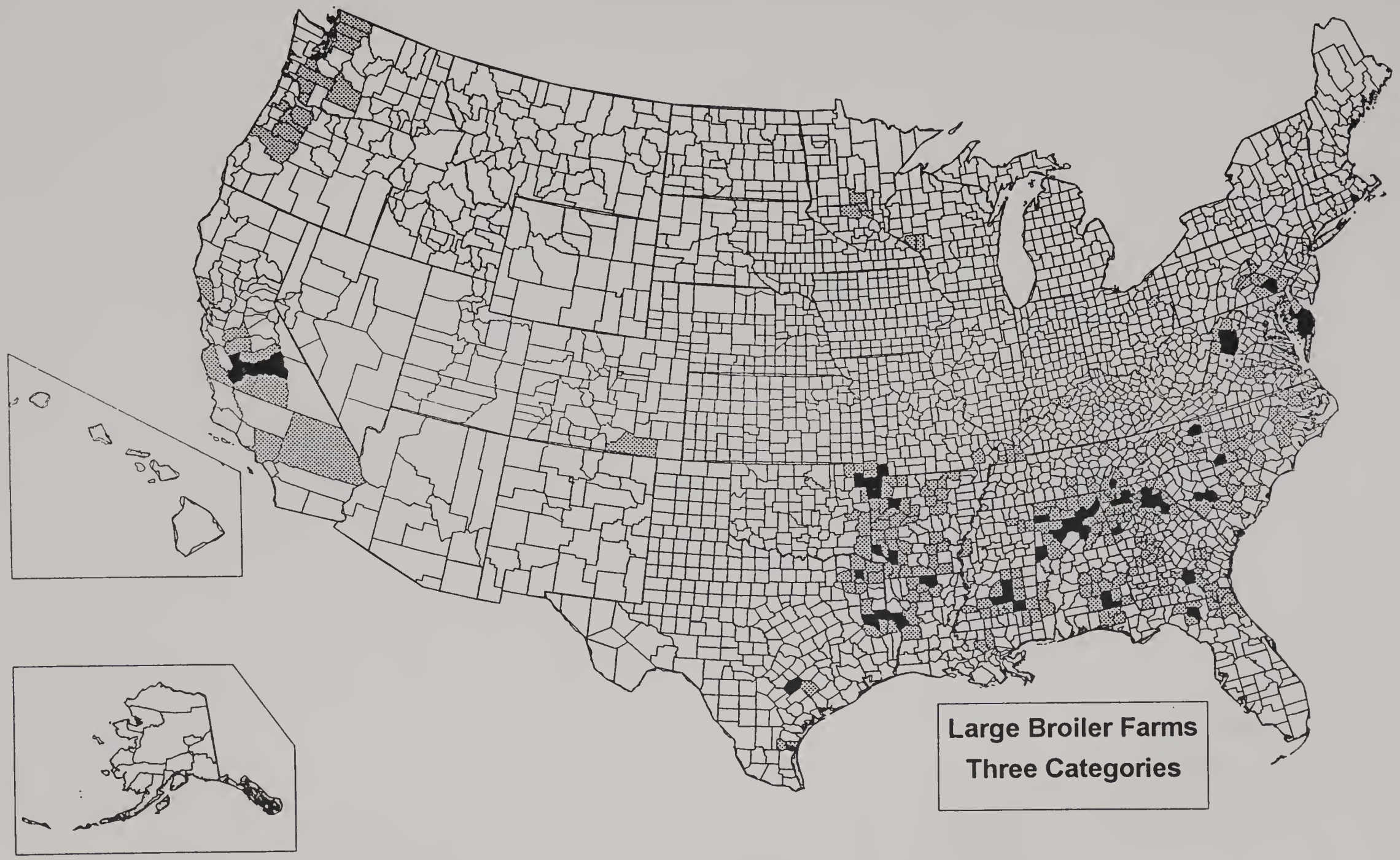
- **Large Broiler Farms**

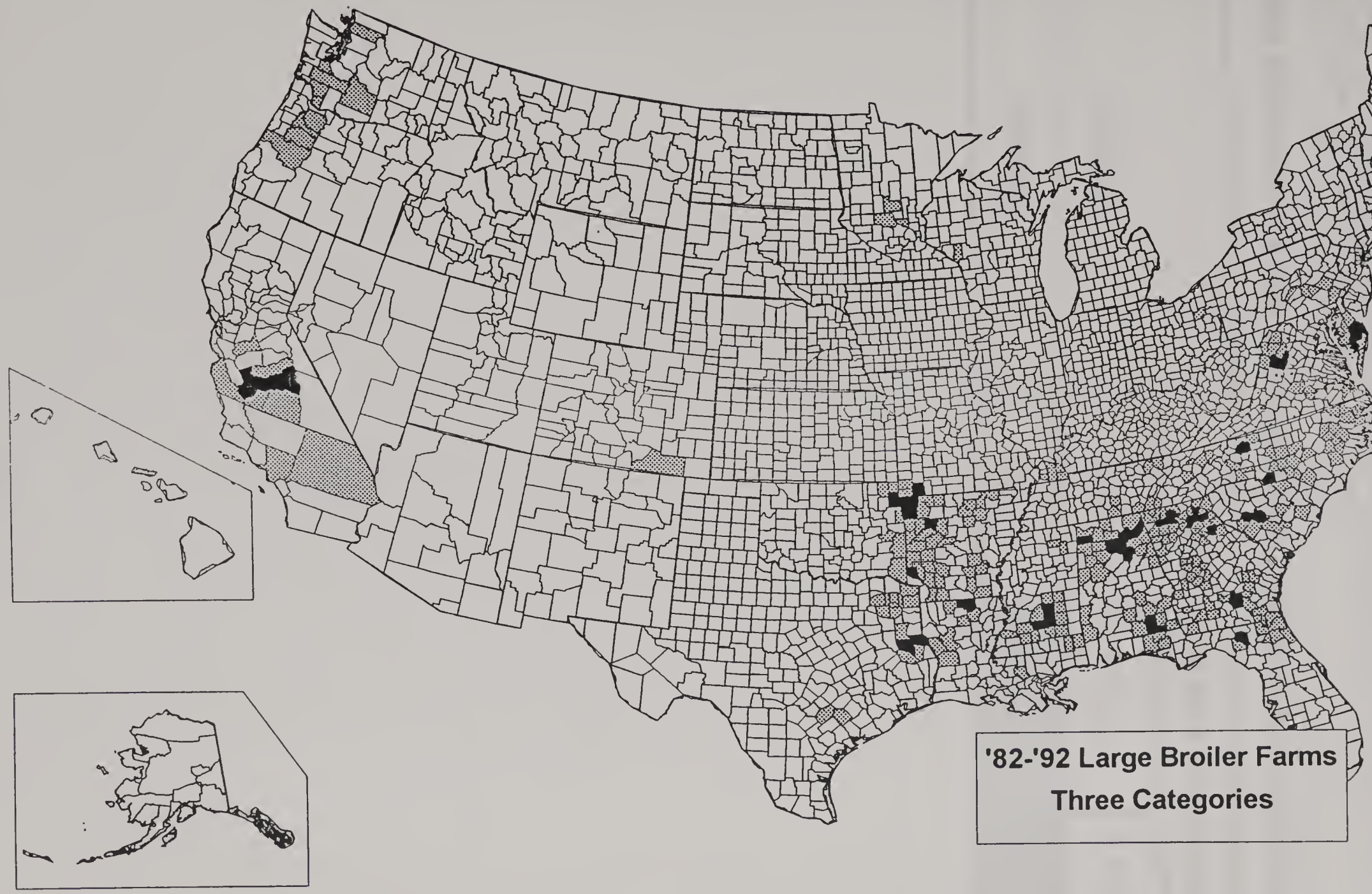
  Number. Counties with more than ten large broiler farms are distributed across the Southeast. Clusters also are found in the Delmarva peninsula and Lancaster County, Pennsylvania.

  Change. Counties that added more than ten large broiler farms are primarily a smaller subset of the aforementioned counties.

Map Shading for Large Broiler Farm Numbers and Change

Category	Large Broiler Farms		
	None	1 to ten	11 or more
Shading	Few	Some	Many


Large Broiler Farms
Three Categories



'82-'92 Large Broiler Farms
Three Categories

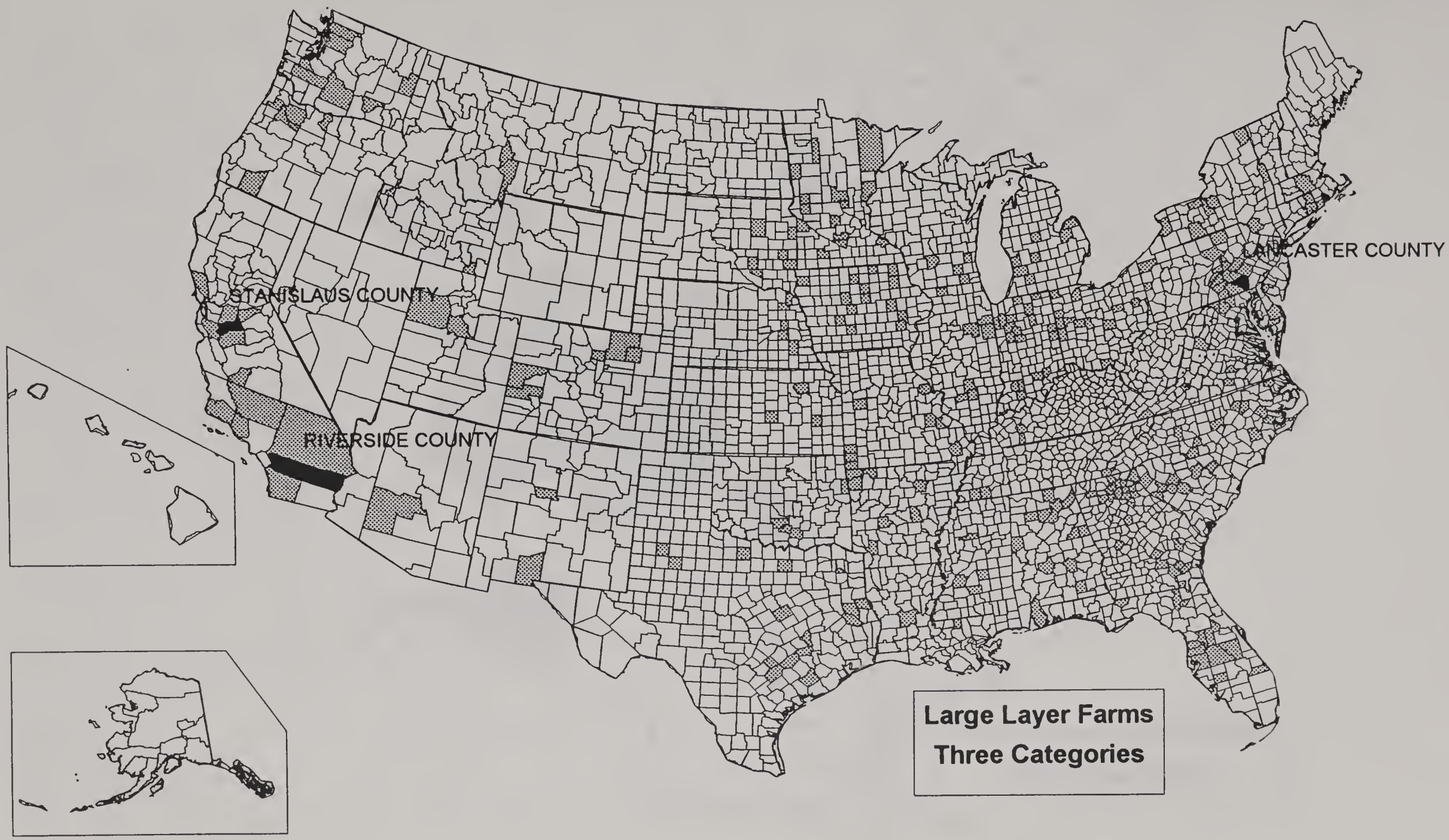
- **Large Pullet and Hen Farms**

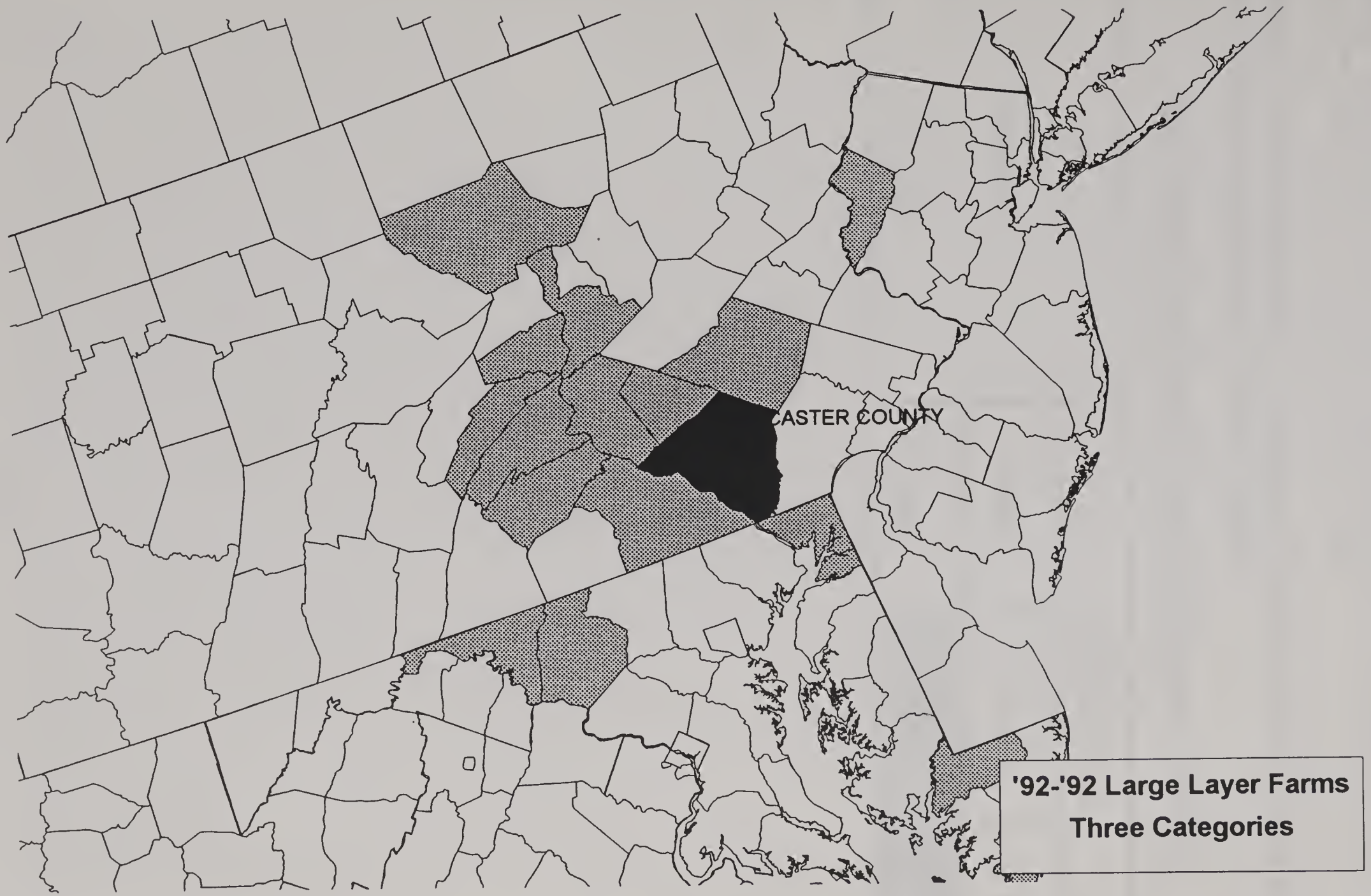
  Number. Counties with more than ten layer farms are few in number.

  Change. Counties adding more than ten large layer farms are primarily found in the Eastern part of the country.

Map Shading for Large Pullet and Hen Farm Numbers and Change

Category	Large Pullet and Hen Farms		
	None	1 to ten	11 or more
Shading	Few	Some	Many


STANISLAUS COUNTY
RIVERSIDE COUNTY
LANCASTER COUNTY
Large Layer Farms
Three Categories


CASTER COUNTY
'92-'92 Large Layer Farms
Three Categories

- **Turkey Farms**

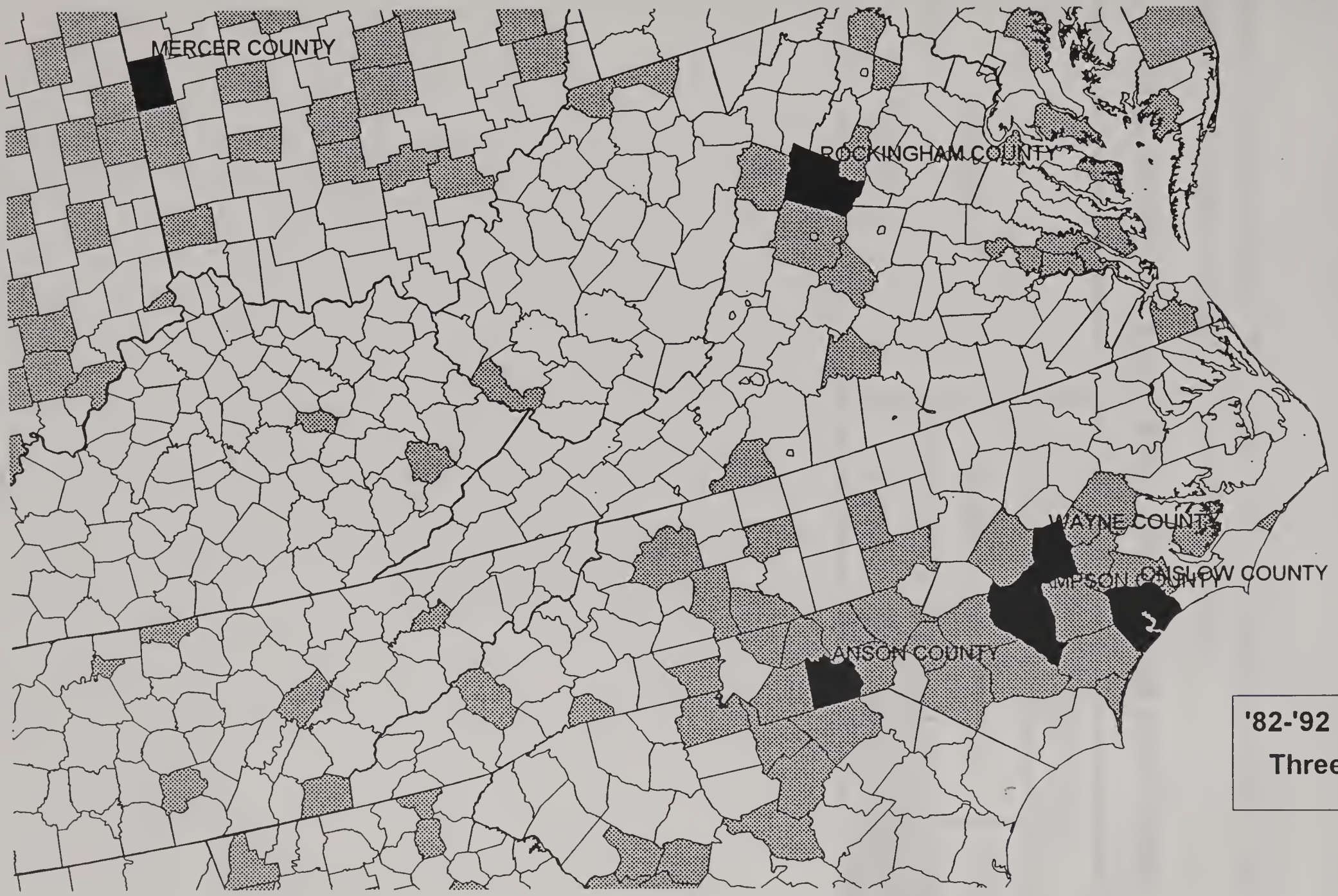
  Number. Only seven counties with more than 50 turkey farms of any size were identified and shown in the map.

  Change. Six counties added more than 50 turkey farms of any size. Four of these counties are in North Carolina.

Map Shading for Turkey Farm Numbers and Change

Category	Turkey Farms		
	None	1 to ten	11 or more
Shading	Few	Some	Many


MERCER COUNTY
ROCKINGHAM COUNTY
DUBOIS COUNTY
MILLER COUNTY
WAYNE COUNTY
DUBLIN COUNTY
BENTON COUNTY
ASHINGTON COUNTY
Turkey Farms
Three Categories


MERCER COUNTY
ROCKINGHAM COUNTY
WAYNE COUNTY
ONSLOW COUNTY
ANSON COUNTY
'82-'92 Turkey Farms
Three Categories

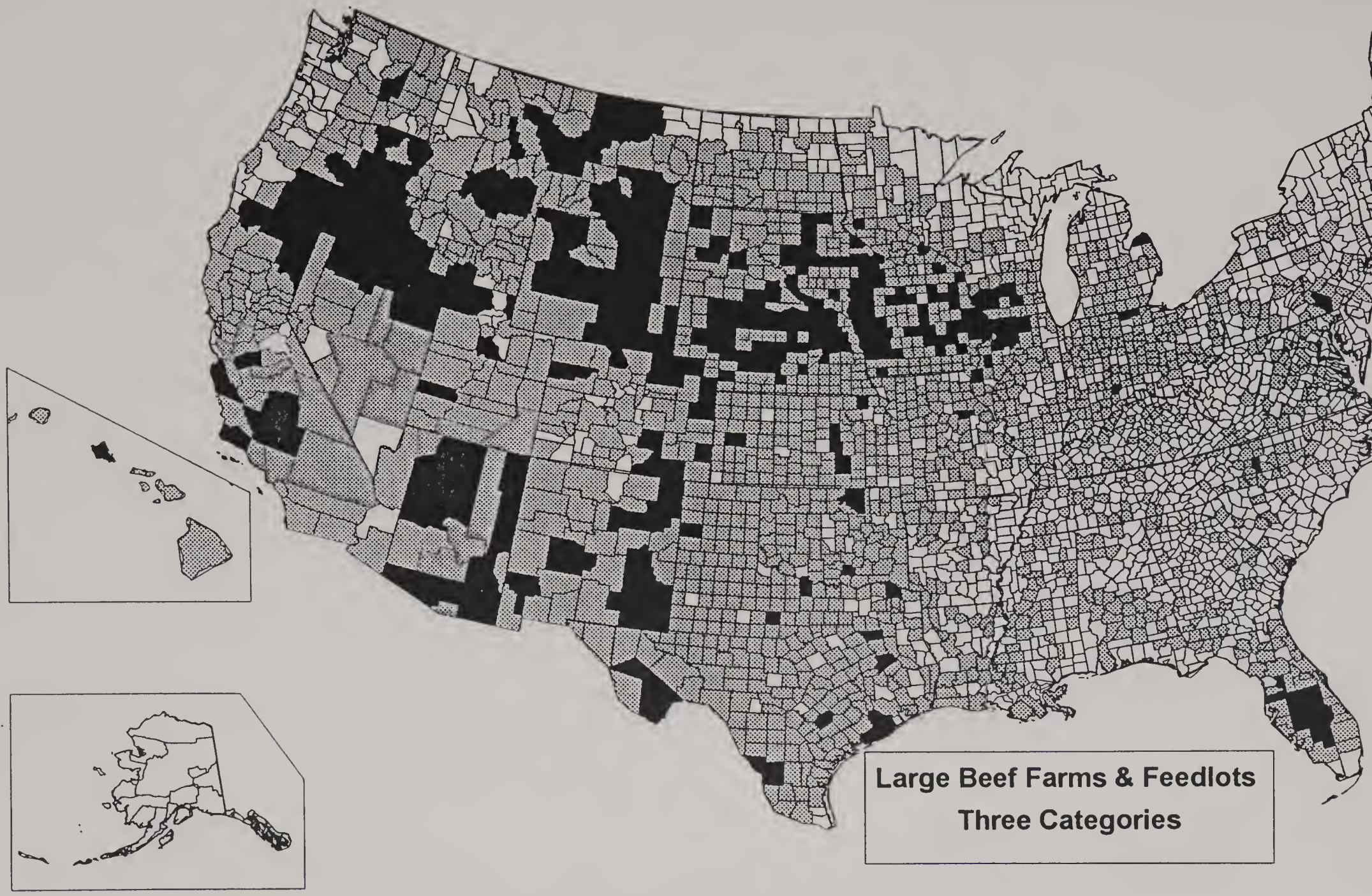
- **Large Beef Units**

  Number. Counties with more than ten large beef units are mainly found in the West, though several Florida counties also are in the highest quartile.

  Change. Counties adding more than ten beef units primarily were located in the West, though five were in Texas.

Map Shading for Large Beef Unit Numbers and Change

Category	Large Beef Units		
	None	1 to ten	11 or more
Shading	Few	Some	Many


Large Beef Farms & Feedlots
Three Categories

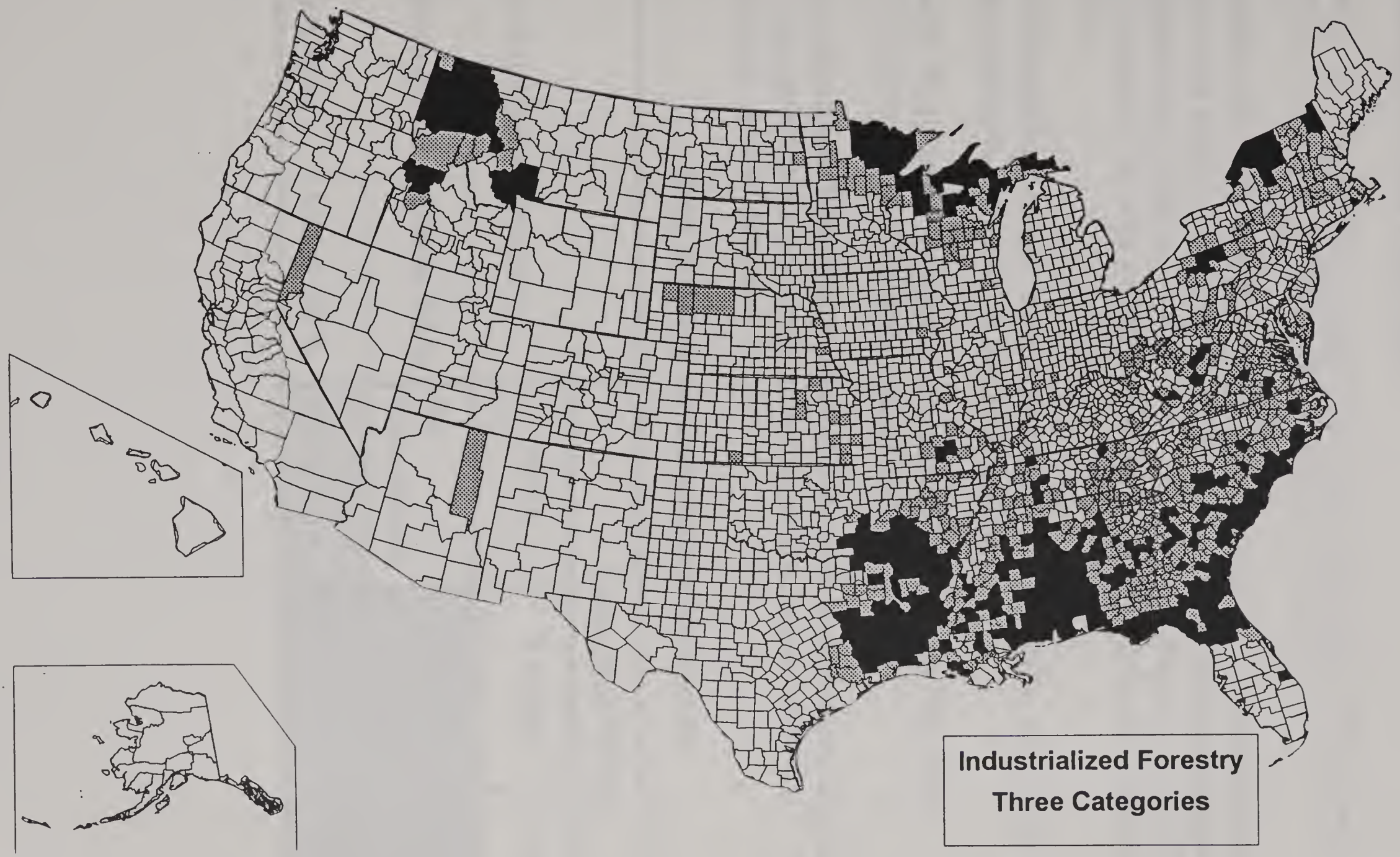
'82-'92 Large Beef Farms
Three Categories

- **Industrialized Forestry**

  Number. The data used here to portray industrialized forestry identifies the coastal Southeast; Northern Minnesota and Wisconsin; and counties in Idaho and Montana.

Map Shading for Industrialized Forestry

Category	Acres of Industrialized Forestry		
	2.1 or fewer acres	2.1 to 53 acres	More than 53 acres
Shading	Few	Some	Many


Industrialized Forestry
Three Categories

Coincidence Indicators

- **Number of Large Hog Farms.**

Poverty. The presence of large hog farms coincides with poverty counties in the lower Midwest and eastern Carolina

Population Change. Several counties with high levels of population growth had high levels of large hog farms. These counties tended to be in Missouri and Illinois; though Iowa, Oklahoma, Arkansas, and North Carolina each had one county coinciding large hog farms and population growth.

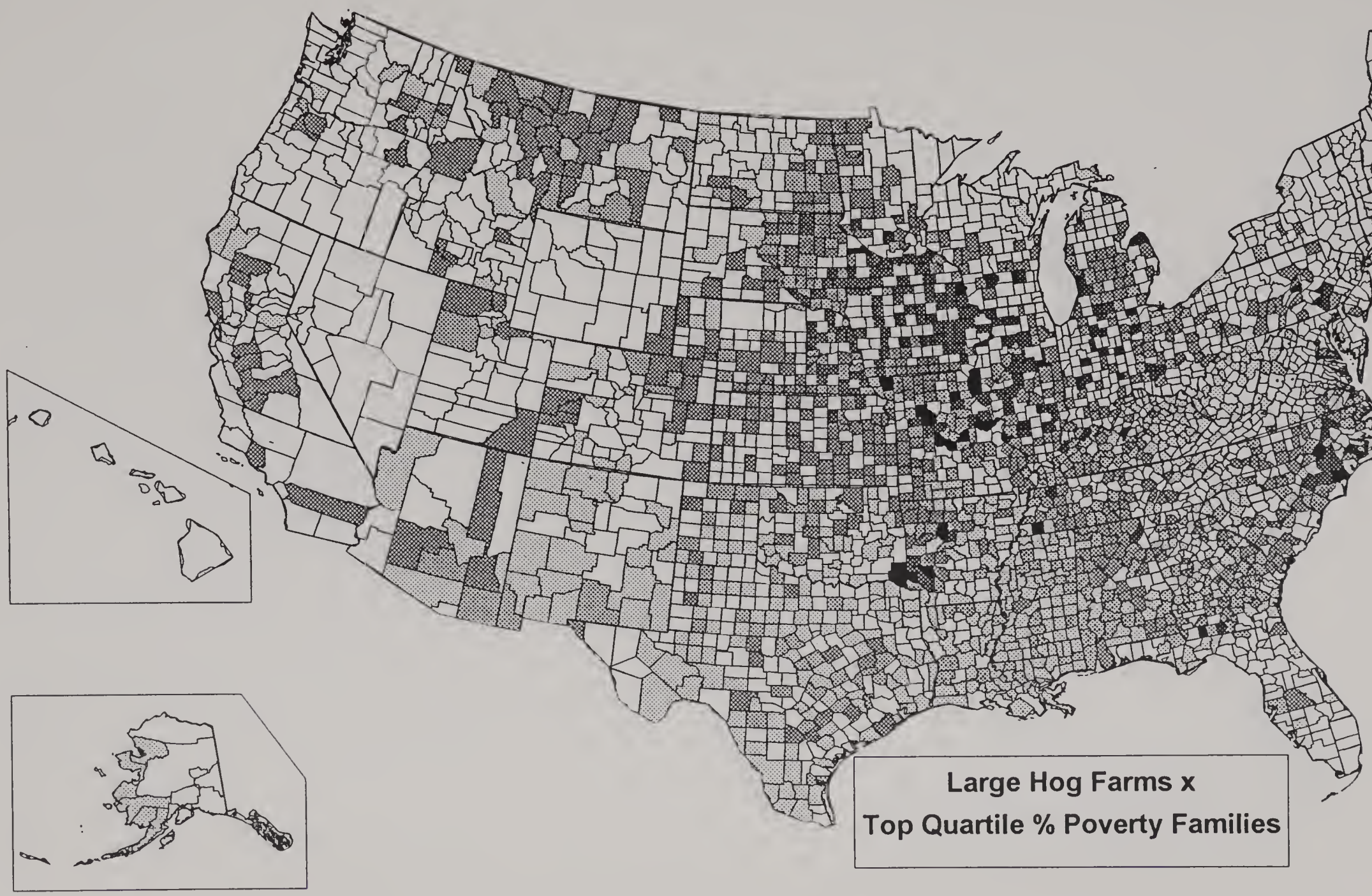
Black Population. Large farm concentrations primarily coincided with and populations primarily in North Carolina.

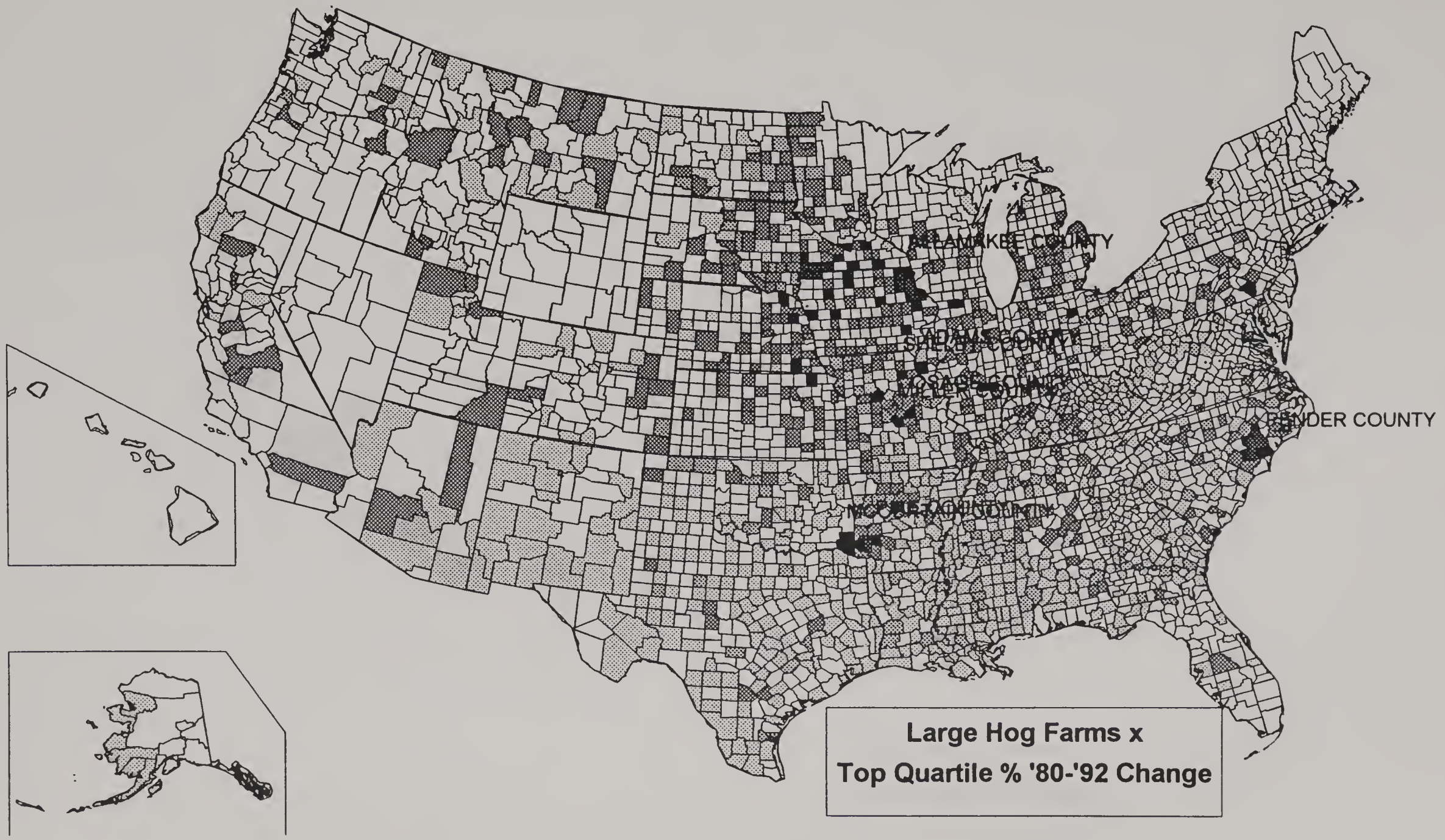
Hispanic Population. Hispanic populations and large hog farm concentrations primarily occurred in the Midwest.

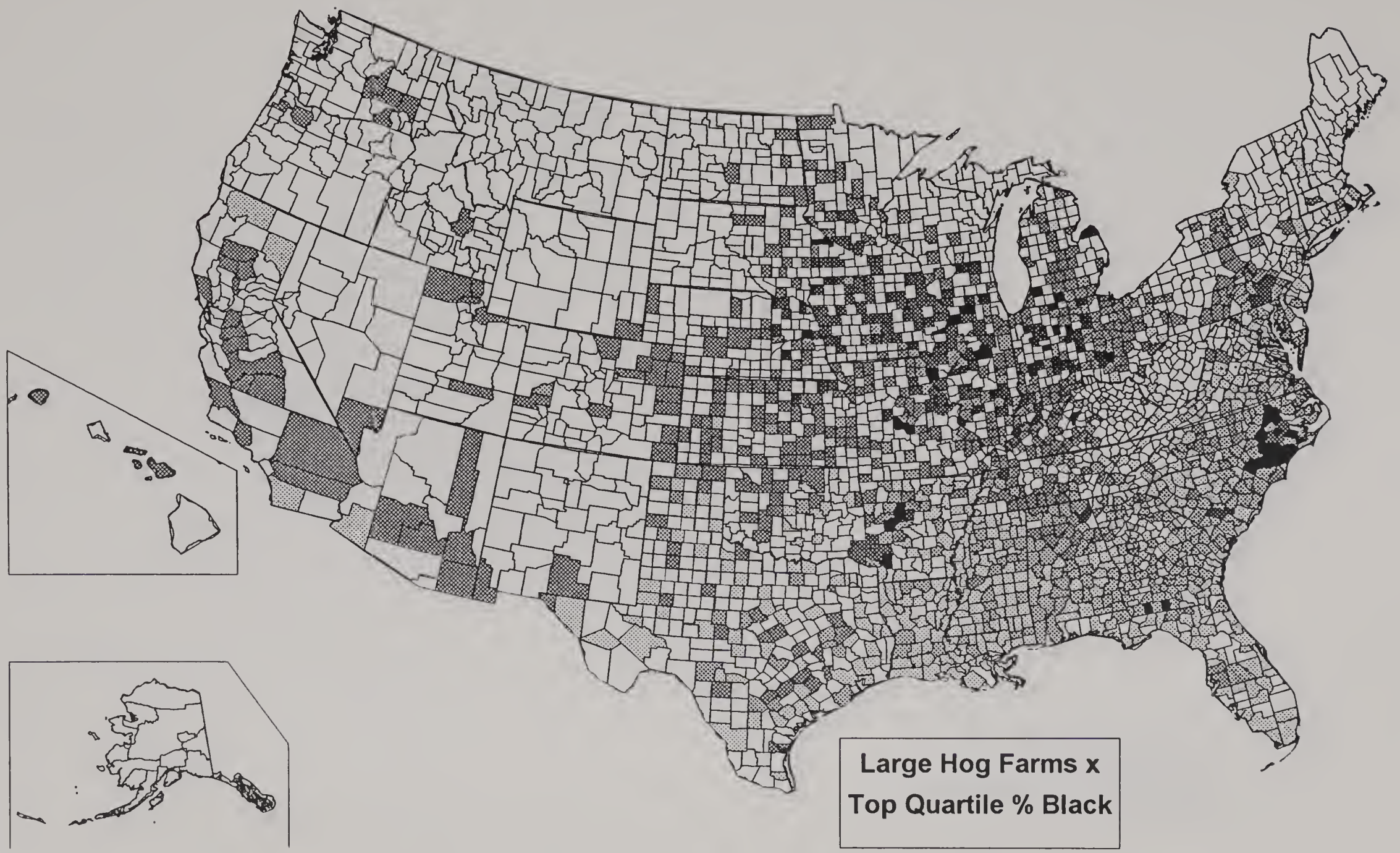
Native American Population. Native American populations and large hog farm concentrations primarily occurred in the upper Midwest – Iowa, Minnesota, and Wisconsin.

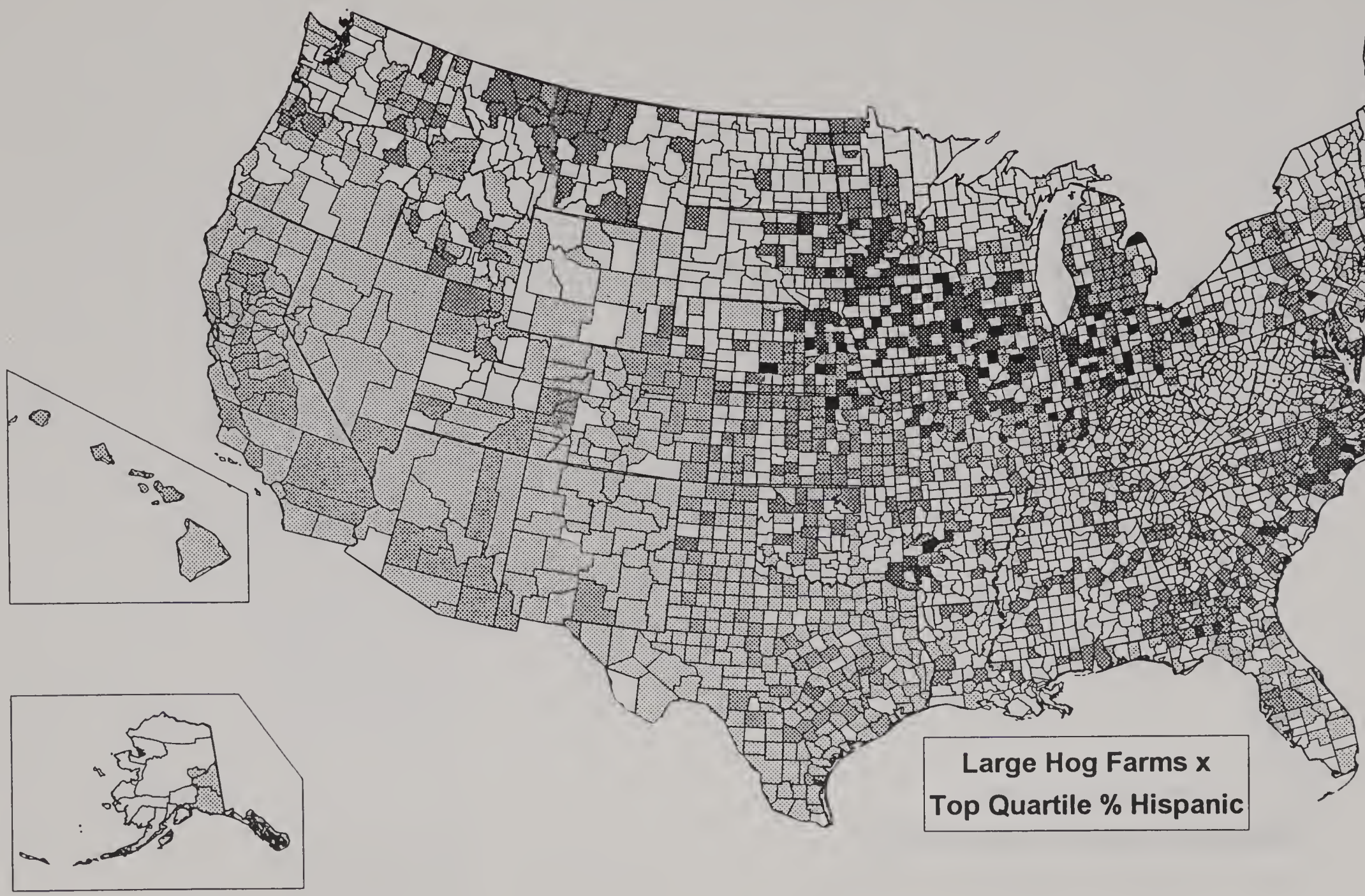
Map Shading for Coincidence Indicators

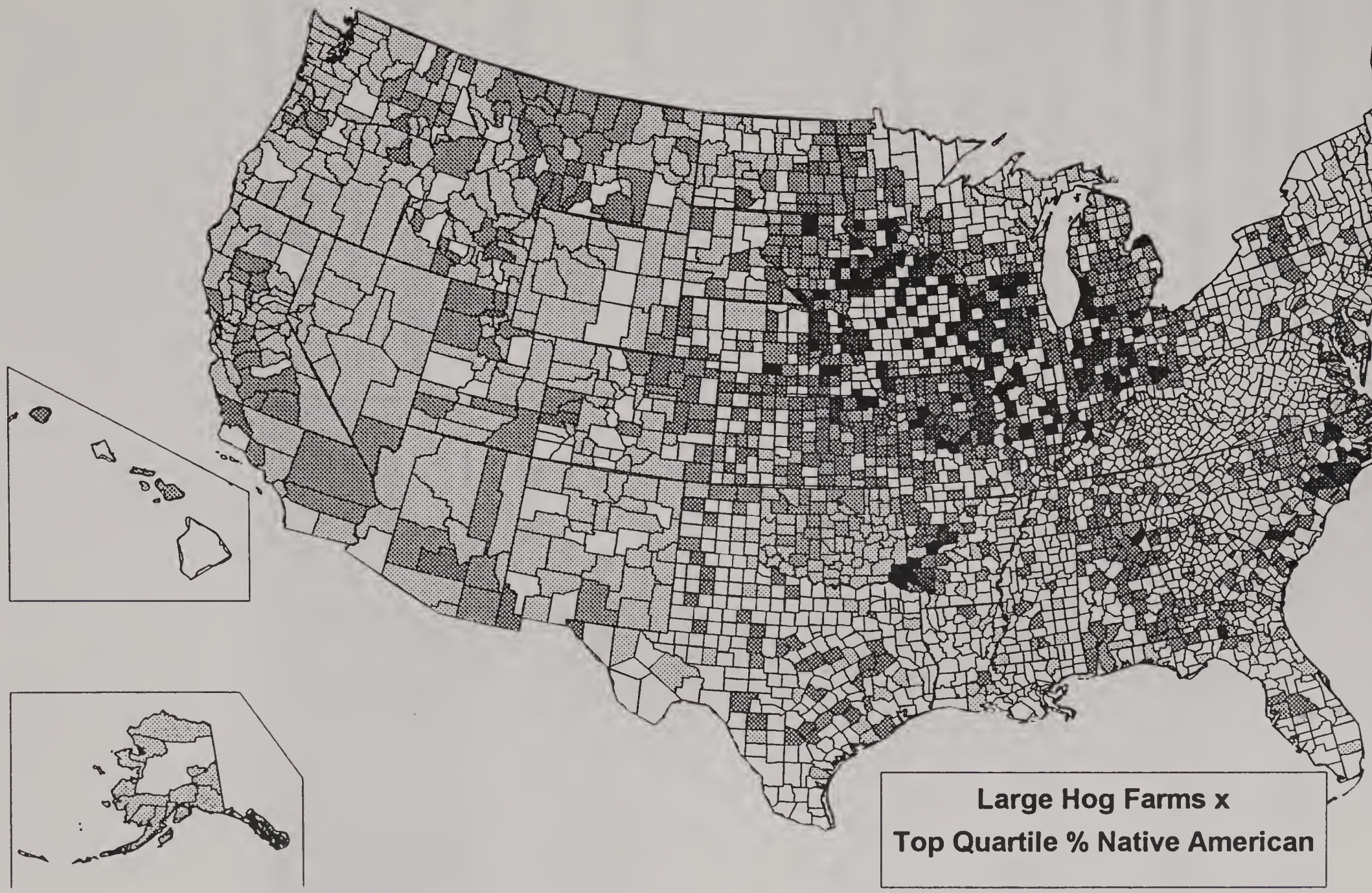
Coincidence Category		Large Hog Farms		
		None	1 to ten	11 or more
Socioeconomic	Middle 50%	No Coincidence	Some Some	Some-Many
Variable	Upper 25%	Many-None	Many-Some	Many-Many


Large Hog Farms x
Top Quartile % Poverty Families


ADAMS COUNTY
MILLER COUNTY
TENDER COUNTY
Large Hog Farms x
Top Quartile % '80-'92 Change


Large Hog Farms x
Top Quartile % Black


Large Hog Farms x
Top Quartile % Hispanic


Large Hog Farms x
Top Quartile % Native American

- **Change in Number of Large Hog Farms.**

Poverty. Poverty and the growth in large-scale hog farming primarily coincided in Oklahoma and North Carolina counties.

Population Change. No counties with high levels of population growth had high growth in numbers of large hog farms.

Black Population. Growth in large hog farm numbers coincided with the presence of a large and population primarily in few North Carolina counties.

Hispanic Population. Growth in large hog farm numbers coincided with the presence of a large Hispanic population primarily in the Midwest and a few Southeast counties.

Native American Population. Growth in large hog farm numbers coincided with the presence of a large Native American population primarily in a few Oklahoma, Minnesota, and North Carolina counties.

Map Shading for Coincidence Indicators

Coincidence Category		Change In Number of Large Hog Farms		
		None	1 to ten	11 or more
Socioeconomic	Middle 50%	No Coincidence	Some-Some	Some-Many
Variable	Upper 25%	Many-None	Many-Some	Many-Many

ALLAMAKEE COUNTY

ADAMS COUNTY

SHELBY COUNTY

SALINE COUNTY

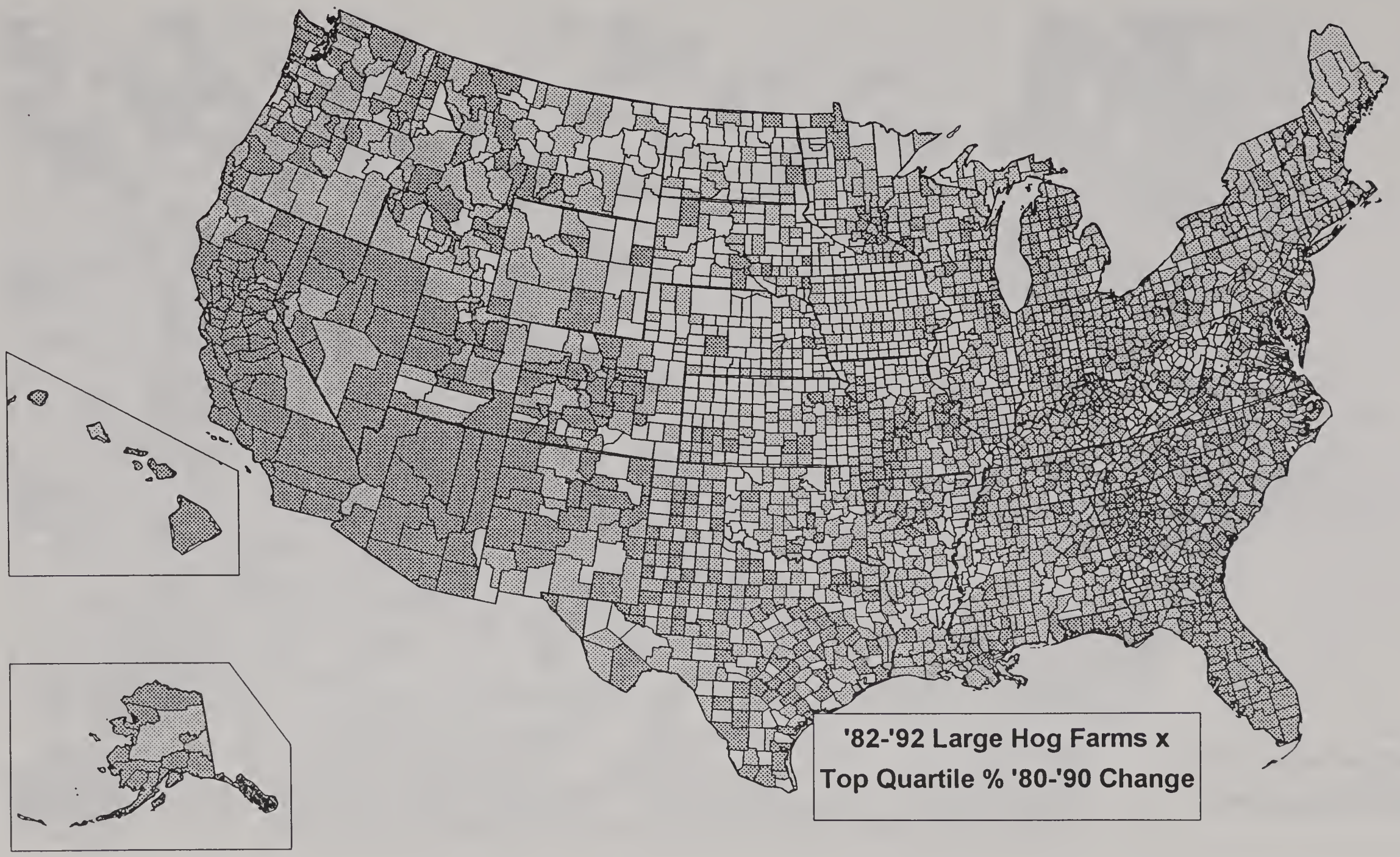
OSAGE COUNTY

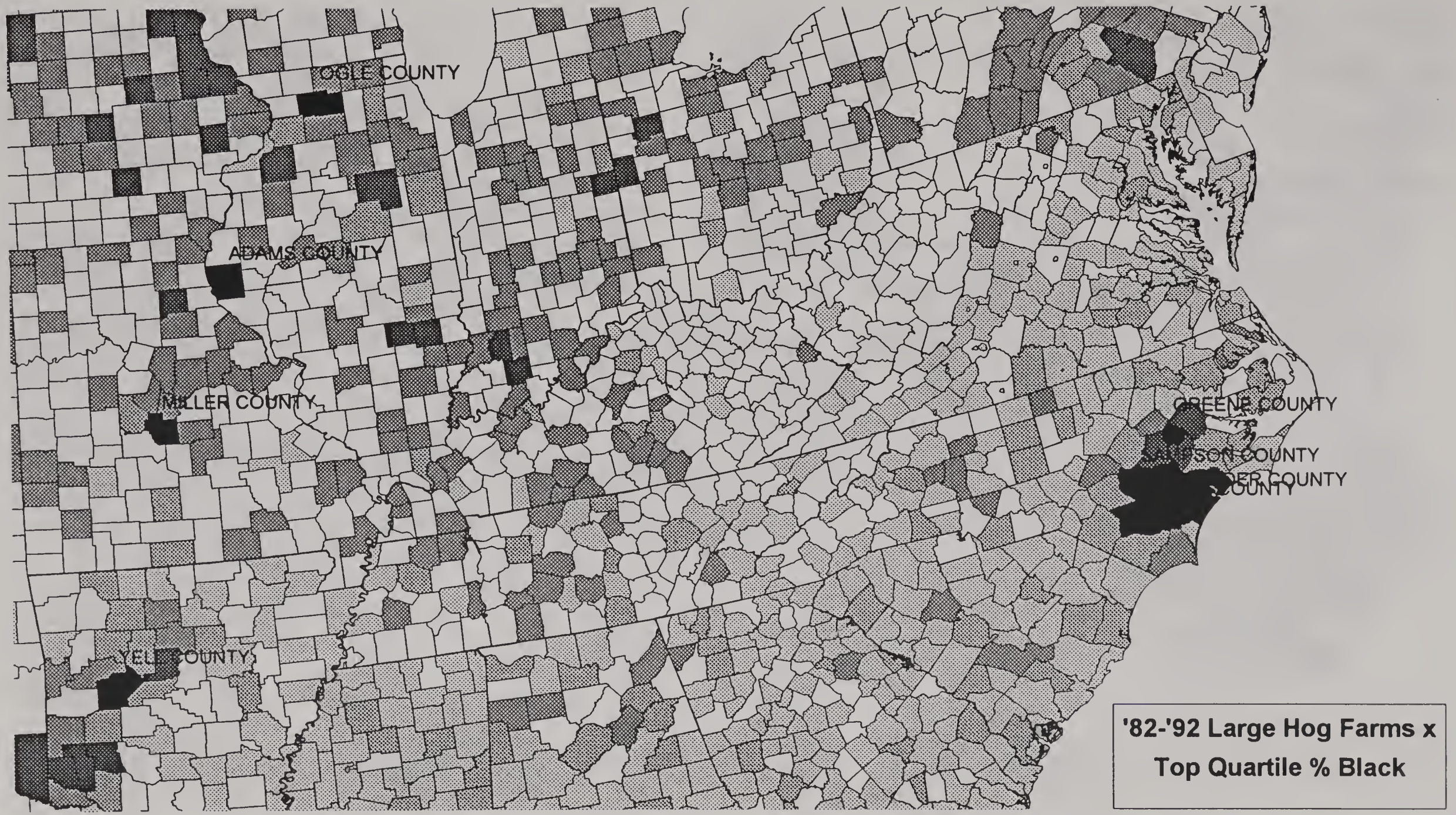
PENDER COUNTY

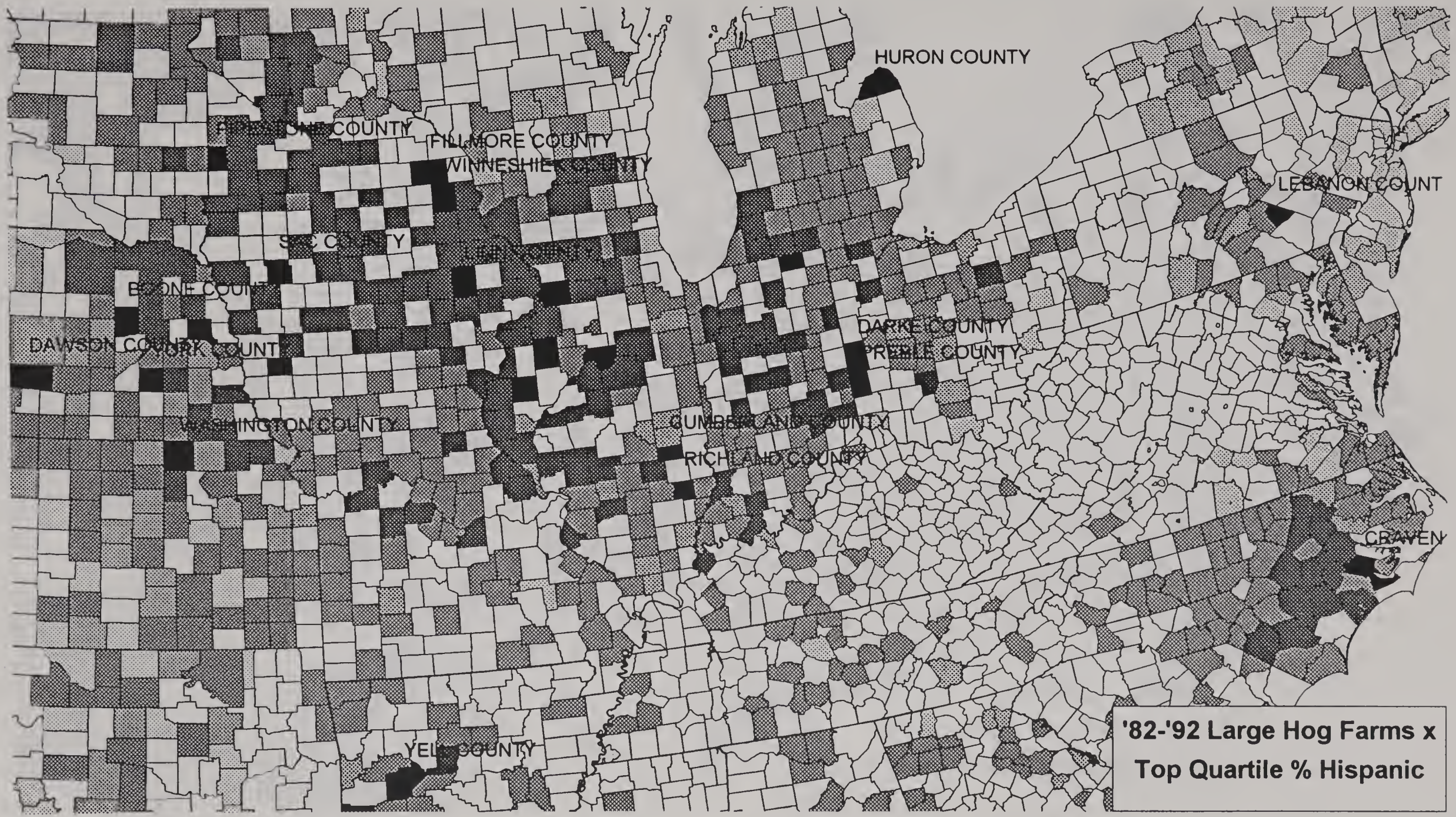
PIKE COUNTY

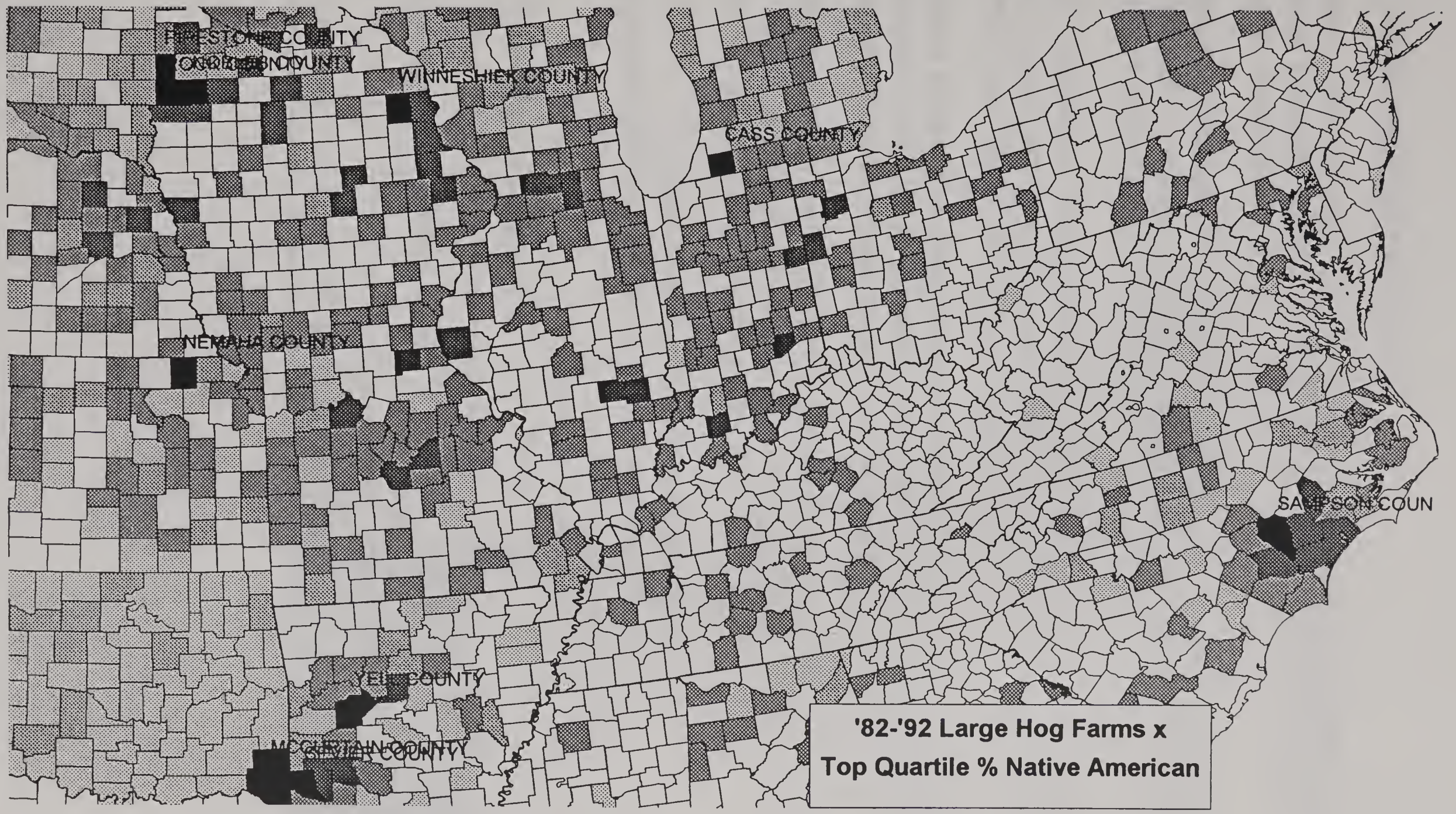
SEVIER COUNTY

'82-'92 Large Hog Farms x
Top Quartile % Poverty Families


'82-'92 Large Hog Farms x
Top Quartile % '80-'90 Change


OGLE COUNTY
ADAMS COUNTY
MILLER COUNTY
GREENE COUNTY
'82-'92 Large Hog Farms x
Top Quartile % Black


HURON COUNTY
FILLMORE COUNTY
LEBANON COUNT
DARKE COUNTY
PREBLE COUNTY
DAWSON COUNTY
WASHINGTON COUNTY
CUMBERLAND COUNTY
RICHLAND COUNTY
CRAVEN
'82-'92 Large Hog Farms x
Top Quartile % Hispanic


PIPESTONE COUNTY
WINNESHIEK COUNTY
CASS COUNTY
NEMAHA COUNTY
SAMPSON COUN
YELL COUNTY
'82-'92 Large Hog Farms x
Top Quartile % Native American

- **Number of Large Broiler Farms.**

Poverty. The presence of large broiler farms and high levels of poverty families primarily coincided in Southeastern counties and Fresno County, California.

Population Change. The presence of large broiler farms and high levels of population change primarily coincided in Southeastern counties, the Delmarva peninsula and Fresno County, California.

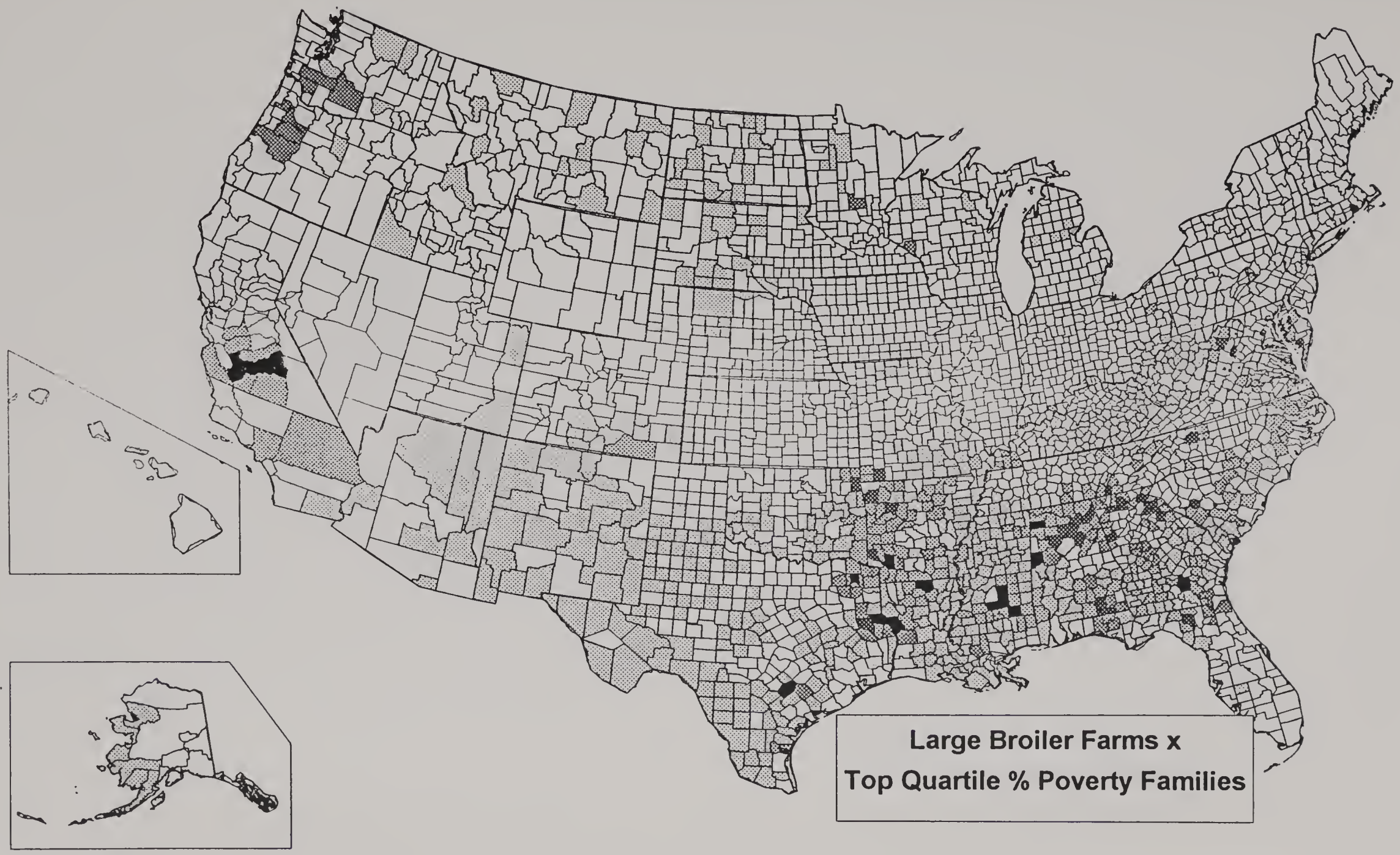
Black Population. The presence of large broiler farms and high levels of Black population primarily coincided in Southeastern counties, the Delmarva peninsula and Fresno County, California.

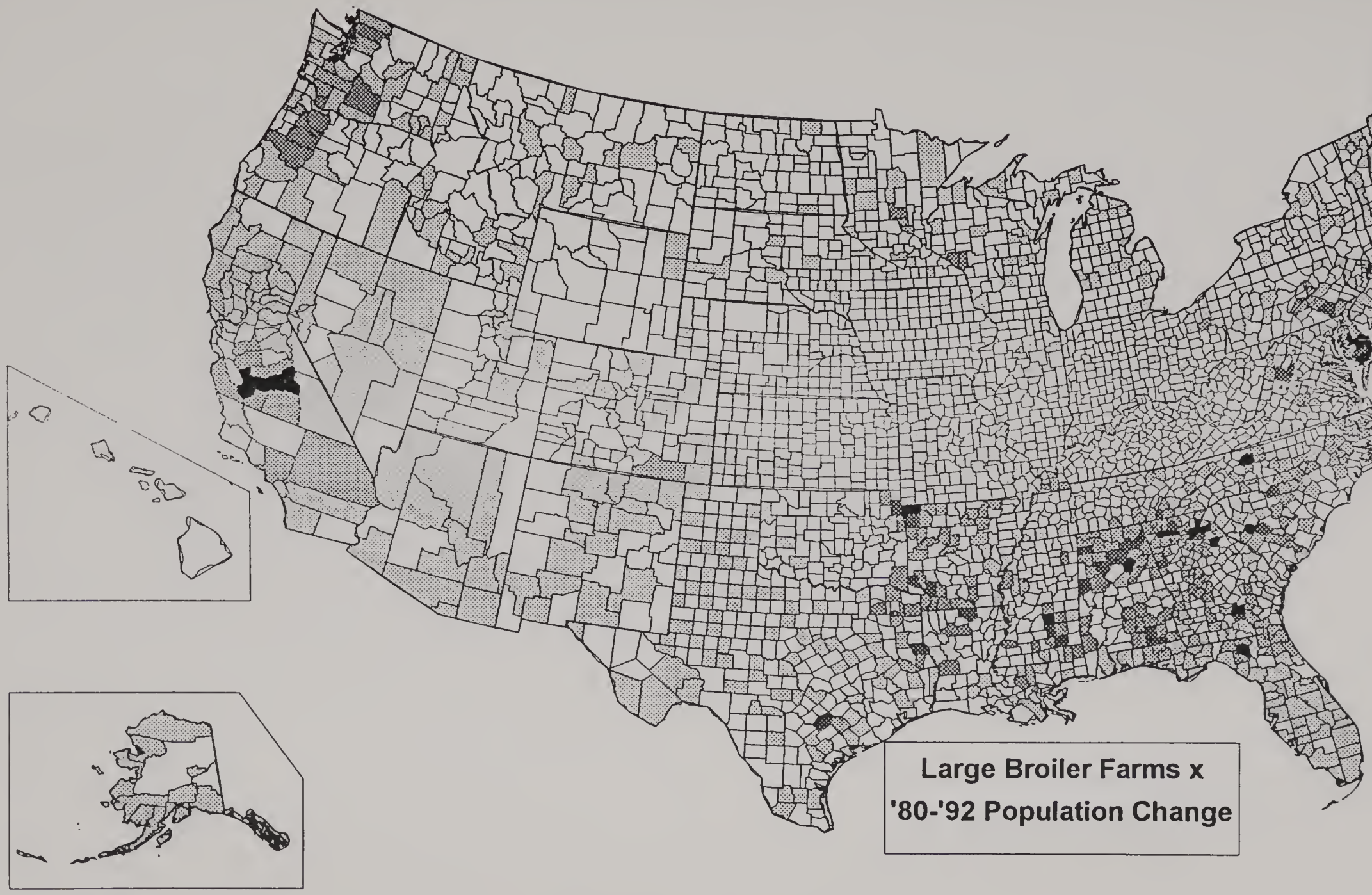
Hispanic Population. The presence of large broiler farms and high levels of Hispanic population primarily coincided in several Texas counties, Lancaster County, Pennsylvania, and Fresno County, California.

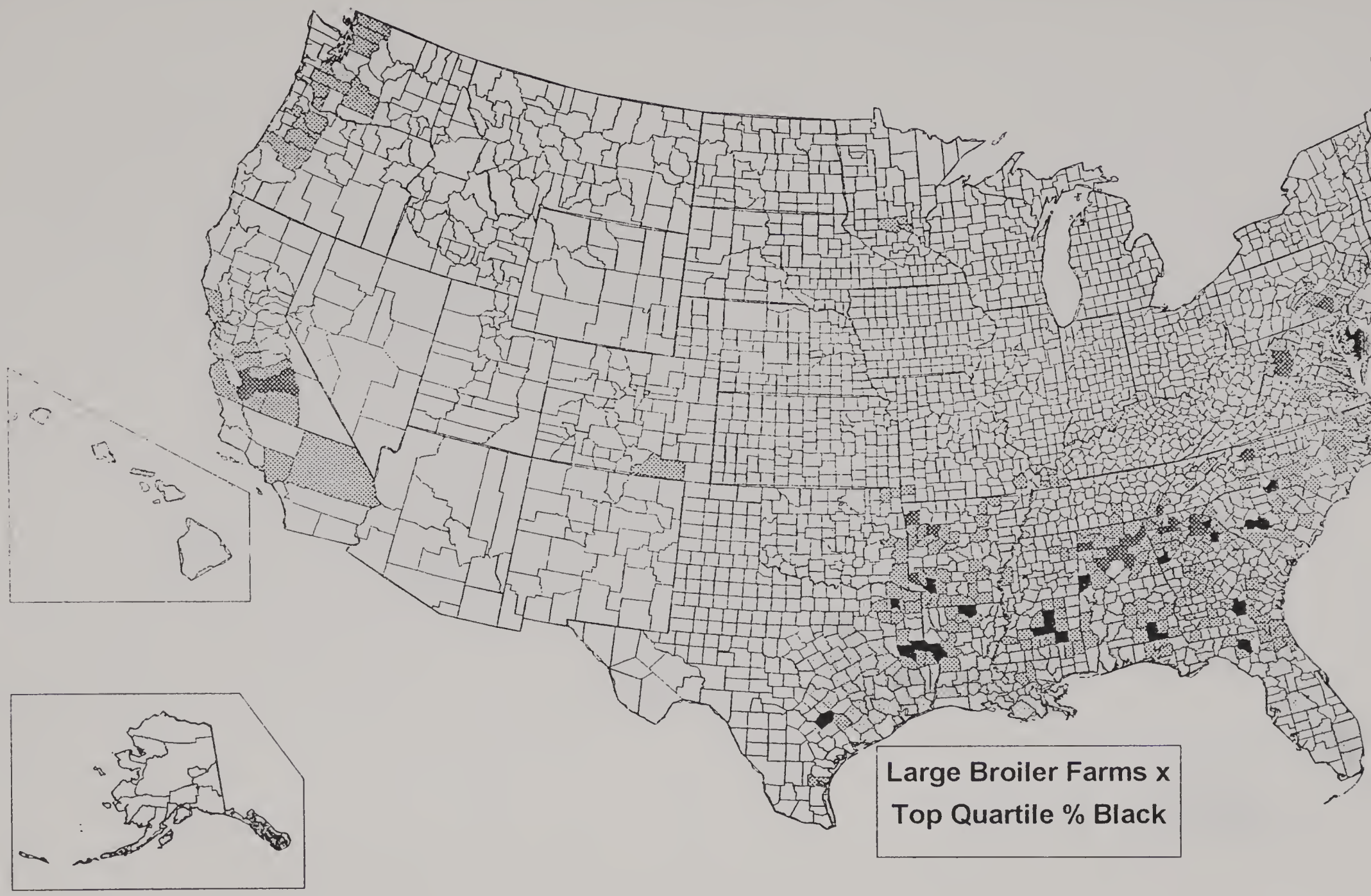
Native American Population. The presence of large broiler farms and high levels of Native Americans primarily coincided in several Arkansas counties, and Fresno County, California.

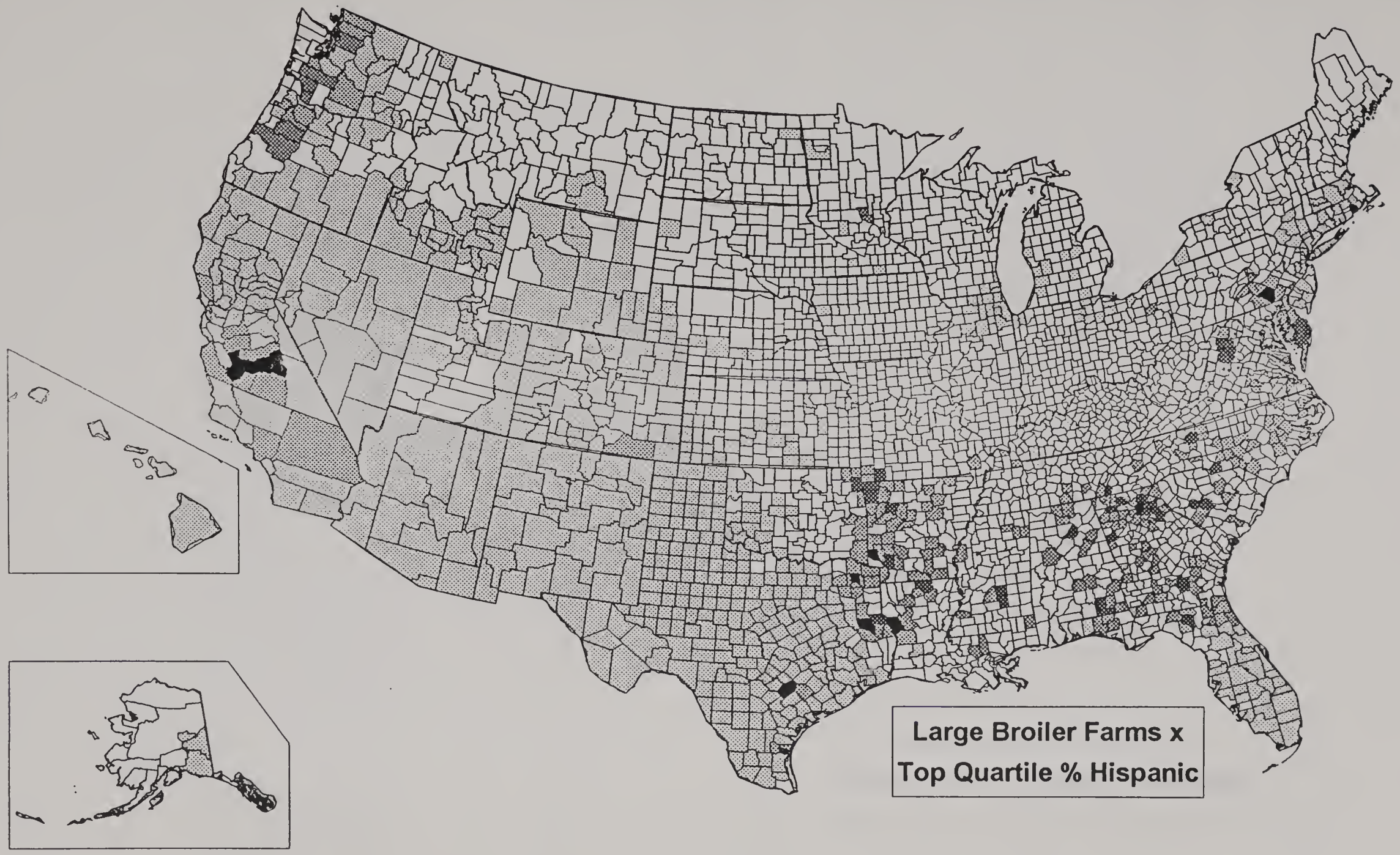
Map Shading for Coincidence Indicators

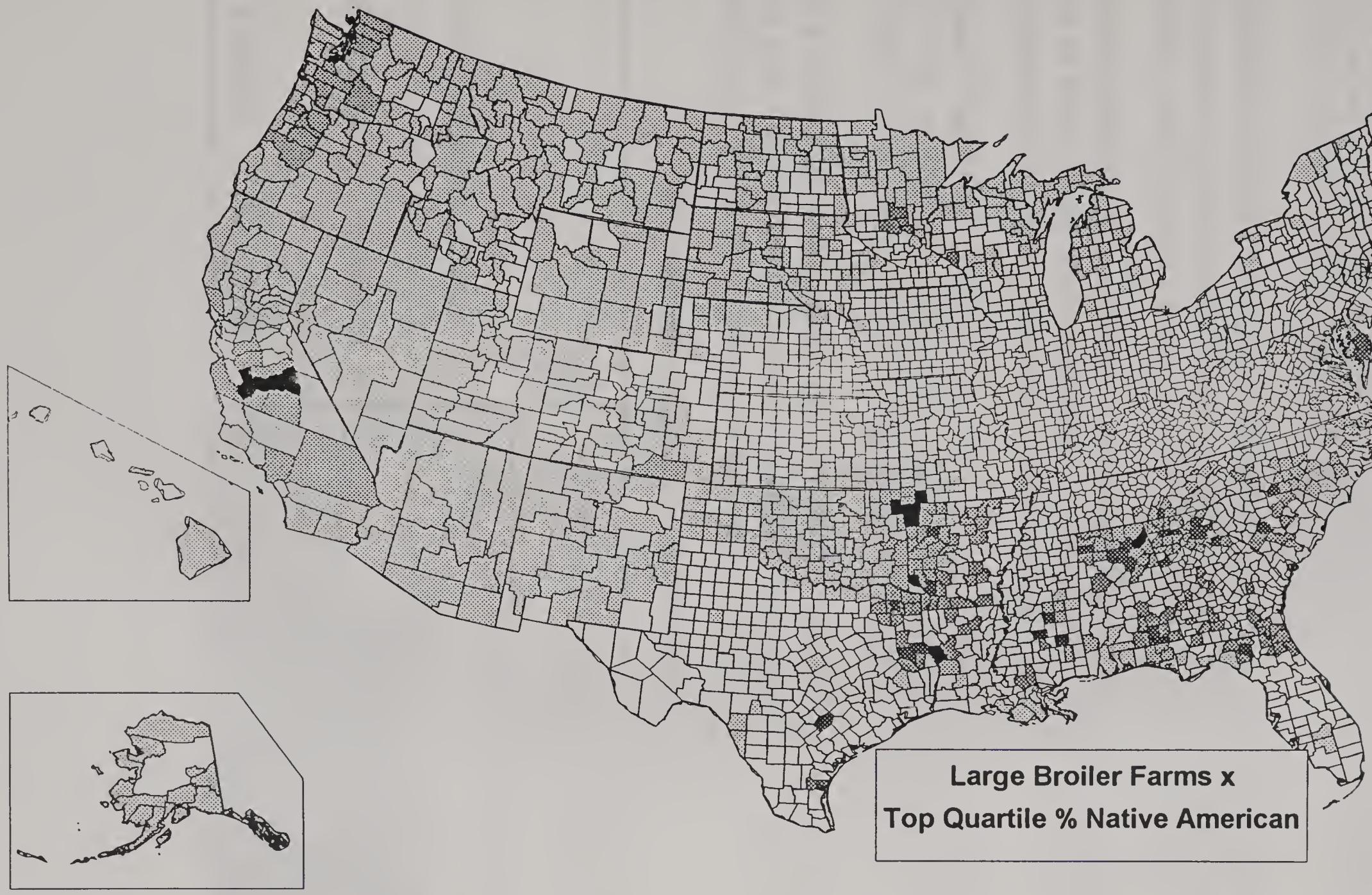
Coincidence Category		Large Broiler Farms		
		None	1 to ten	11 or more
Socioeconomic	Middle 50%	No Coincidence	Some Some	Some-Many
Variable	Upper 25%	Many-None	Many-Some	Many-Many


Large Broiler Farms x
Top Quartile % Poverty Families


Large Broiler Farms x
'80-'92 Population Change


Large Broiler Farms x
Top Quartile % Black


Large Broiler Farms x
Top Quartile % Hispanic


Large Broiler Farms x
Top Quartile % Native American

- **Change in Number of Large Broiler Farms.**

Poverty. Growth in the presence of large broiler farms and high levels of family poverty primarily coincided in a small number of Southeastern counties, and Fresno County, California.

Population Change. Growth in the presence of large broiler farms and high levels of population change primarily coincided in Southeastern counties, the Delmarva peninsula and Fresno County, California.

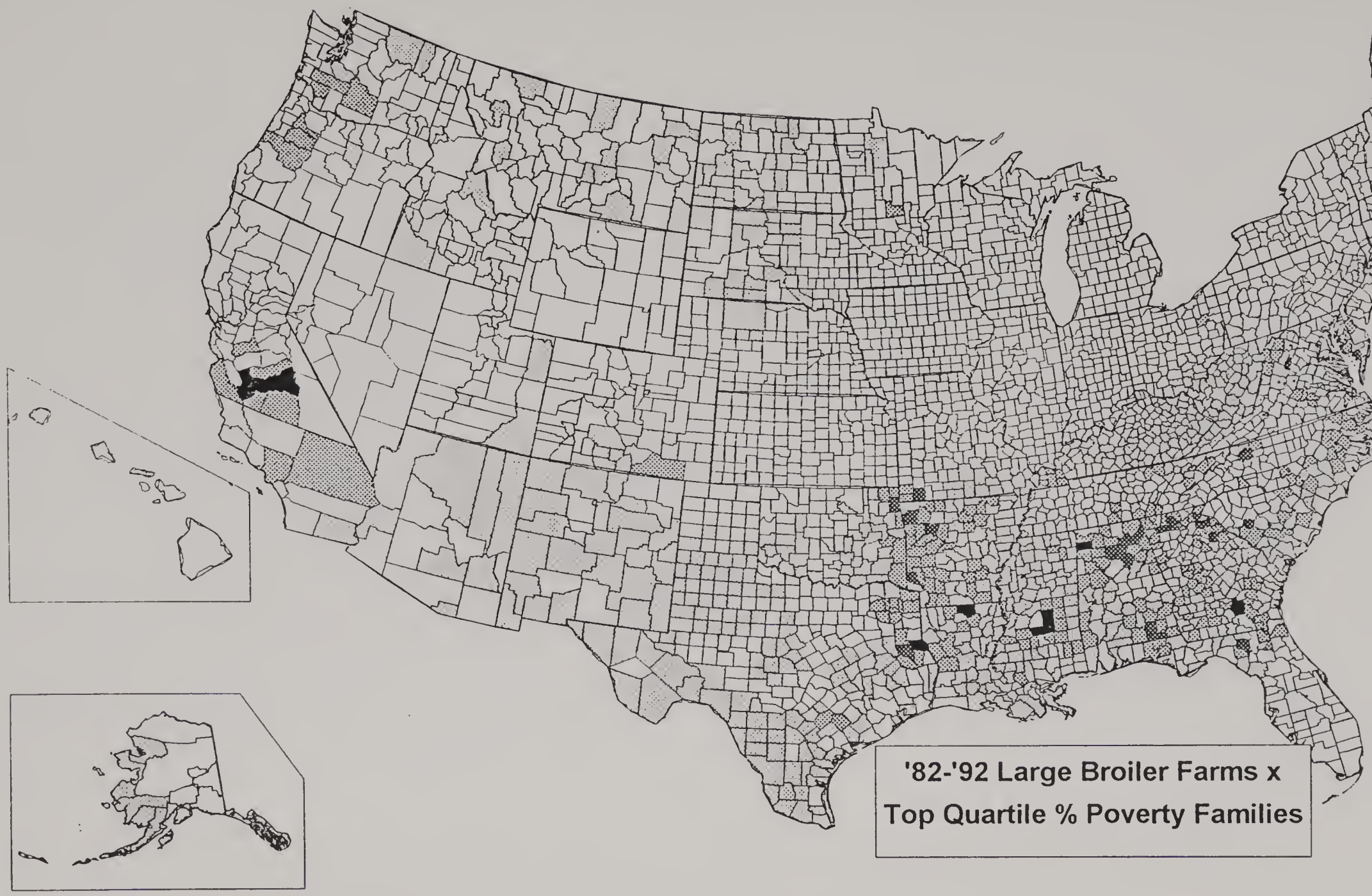
Black Population. Growth in the presence of large broiler farms and high levels of Black population primarily coincided in a small number of Southeastern counties, and the Delmarva peninsula.

Hispanic Population. Growth in the presence of large broiler farms and high levels of Hispanic population primarily coincided in Southeastern counties, Northwest Arkansas, and Fresno County, California.

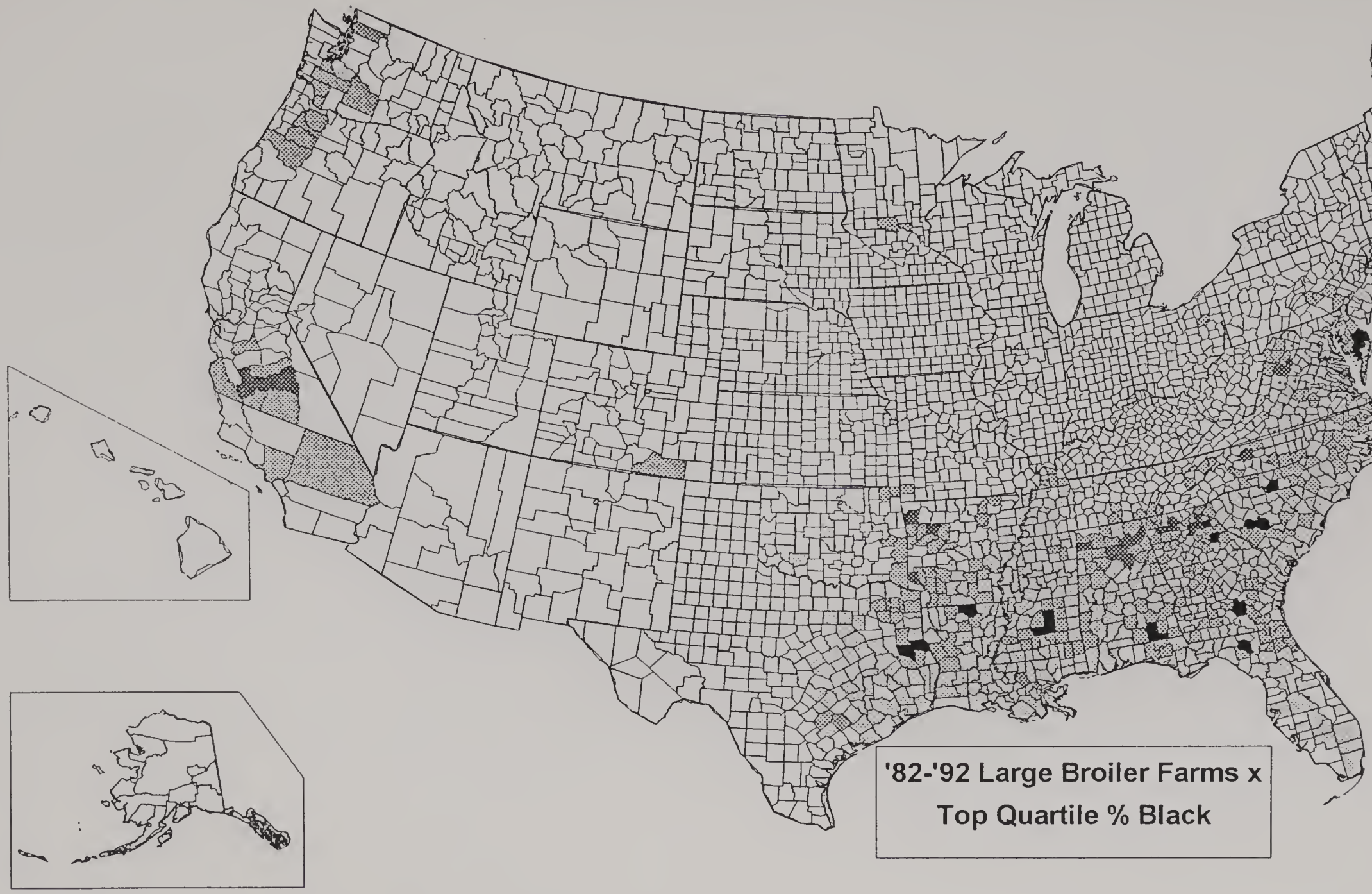
Native American Population. Growth in the presence of large broiler farms and high levels of Native American population primarily coincided in Northwest Arkansas, and Fresno County, California

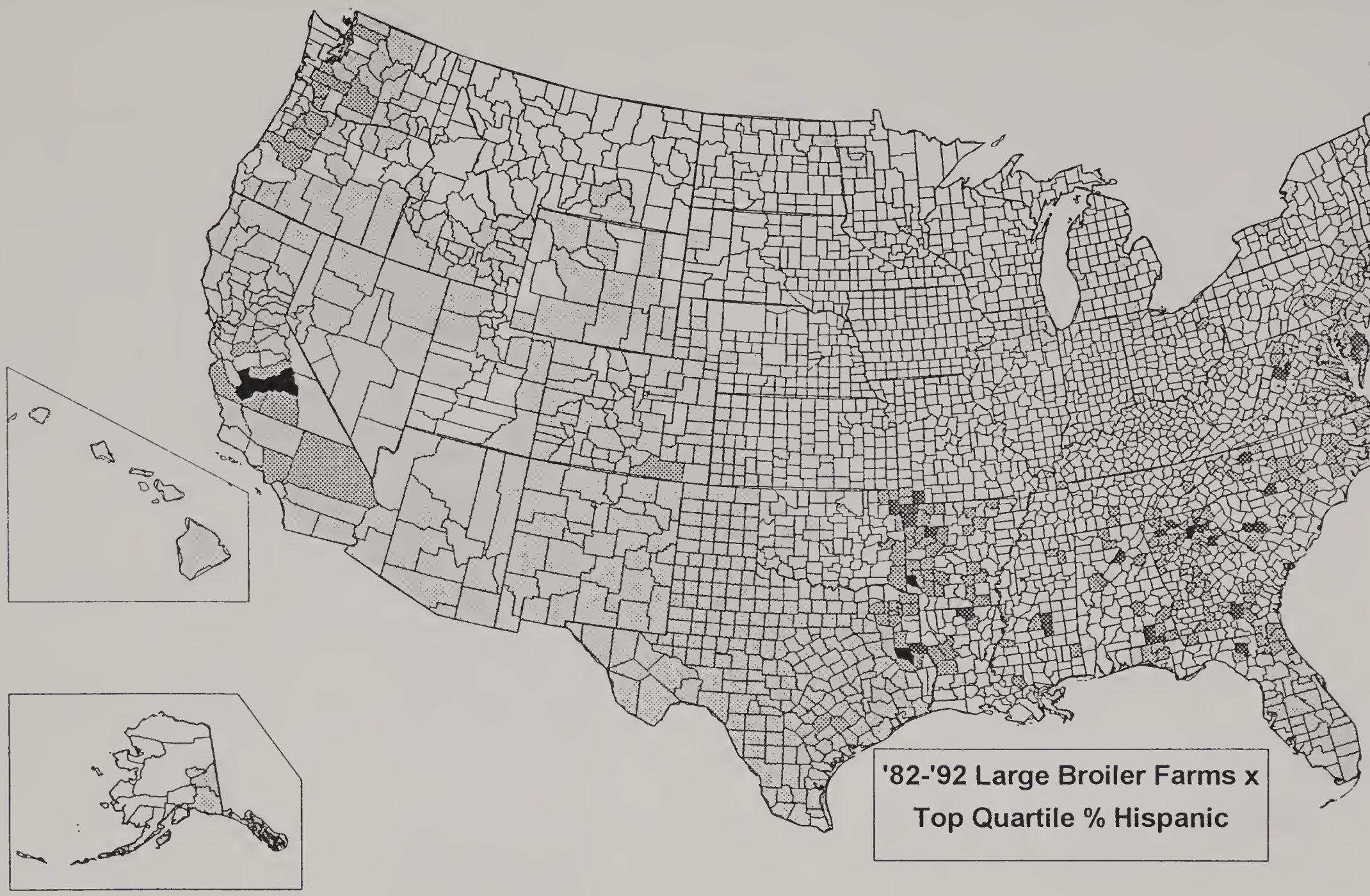
Map Shading for Coincidence Indicators

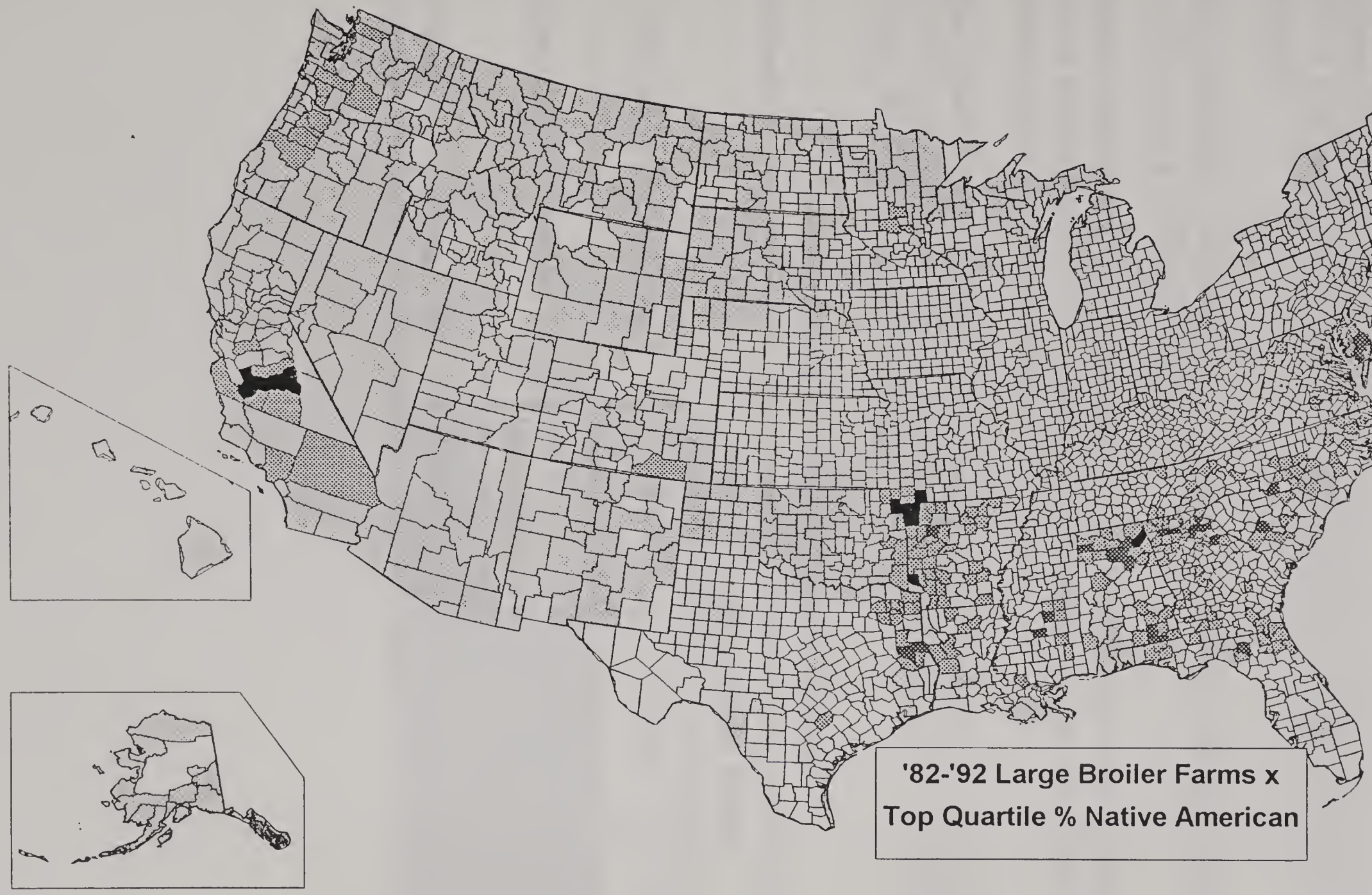
Coincidence Category		Change in Number of Large Broiler Farms		
		None	1 to ten	11 or more
Socioeconomic	Middle 50%	No Coincidence	Some-Some	Some-Many
Variable	Upper 25%	Many-None	Many-Some	Many-Many


'82-'92 Large Broiler Farms x
Top Quartile % Poverty Families

'82-'92 Large Broiler Farms x
'80-'92 Population Change


'82-'92 Large Broiler Farms x
Top Quartile % Black


'82-'92 Large Broiler Farms x
Top Quartile % Hispanic


'82-'92 Large Broiler Farms x
Top Quartile % Native American

- **Number of Large Layer Farms.**

Poverty. The presence of large layer farms did not coincide with poverty families.

Population Change. The presence of large layer farms did coincide high levels of population change in two California counties: Riverside and Stanislaus.

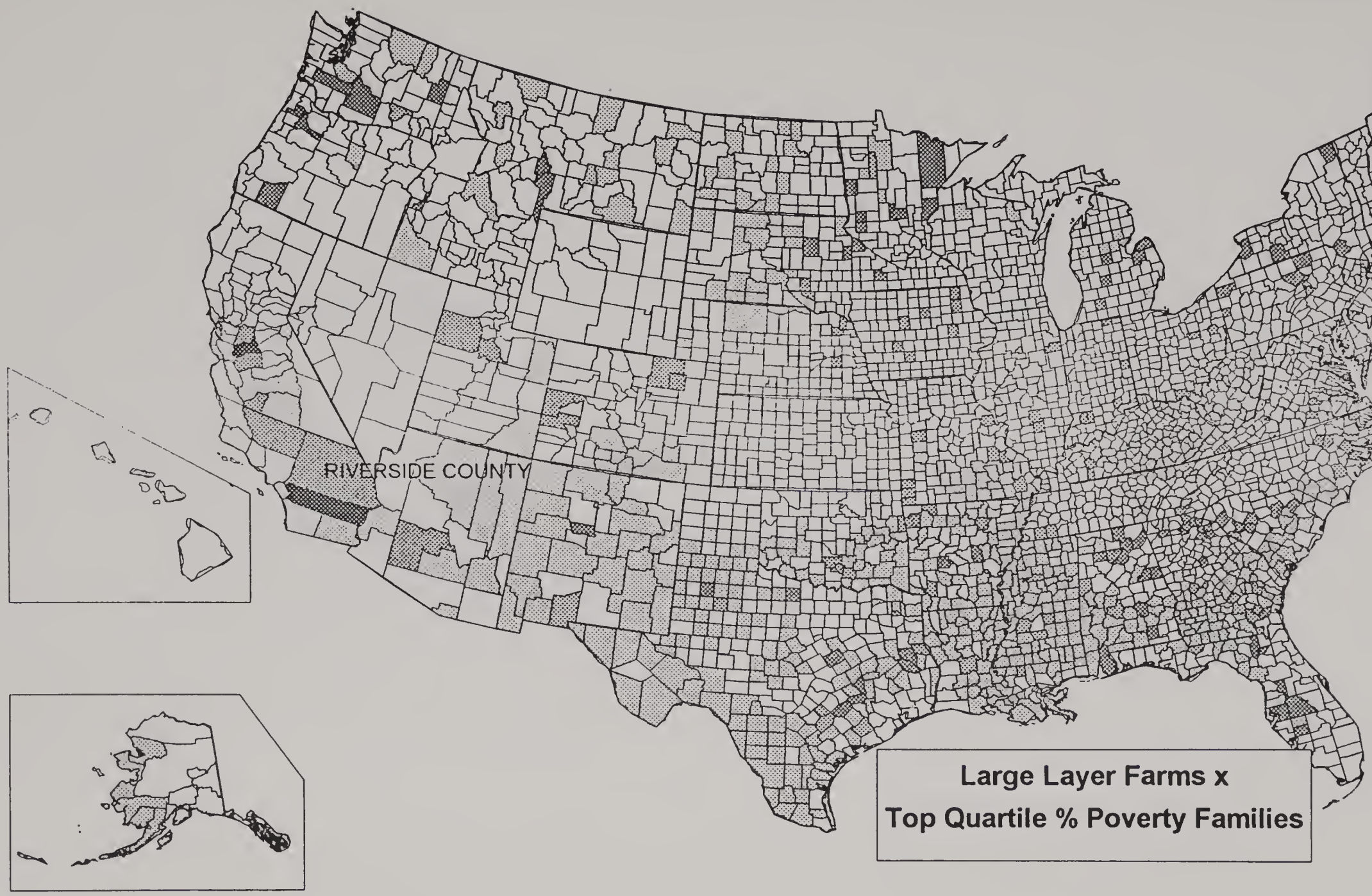
Black Population. The presence of large layer farms did not coincide with high levels of Black population.

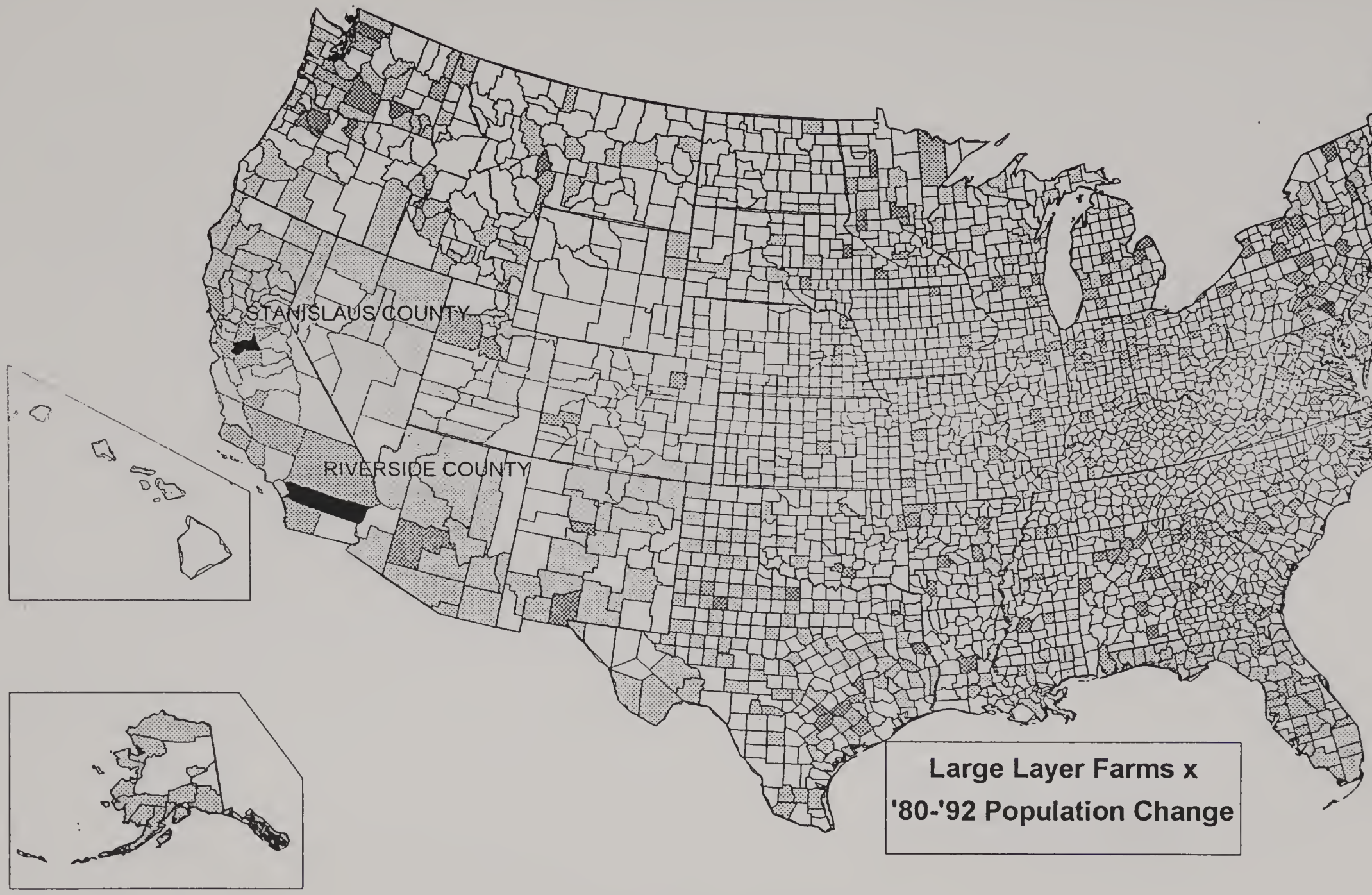
Hispanic Population. The presence of large layer farms did coincide high levels of Hispanics in Lancaster County, Pennsylvania, and two California counties: Riverside and Stanislaus.

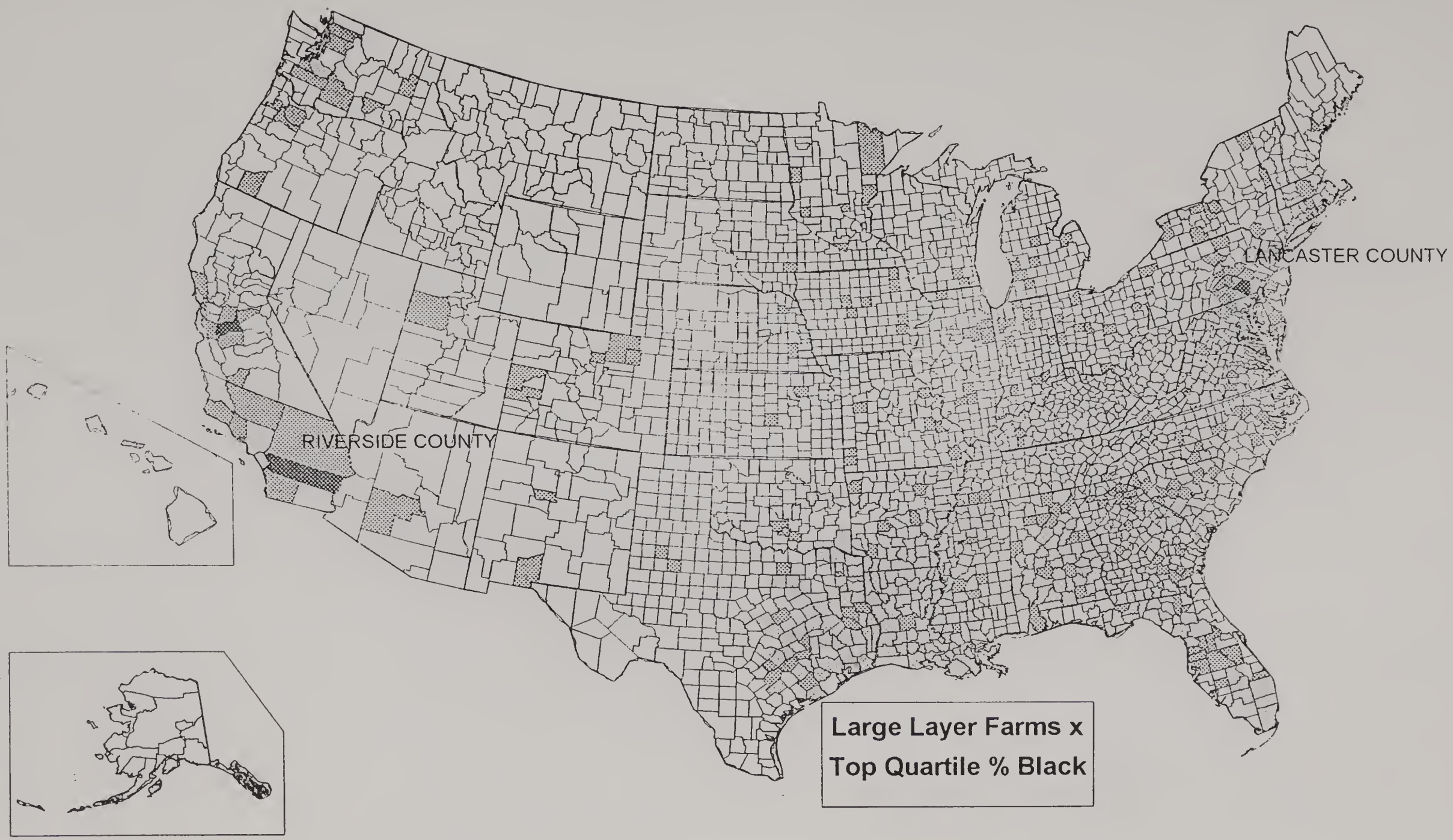
Native American Population. The presence of large layer farms did coincide high levels of Native American Population in two California counties: Riverside and Stanislaus.

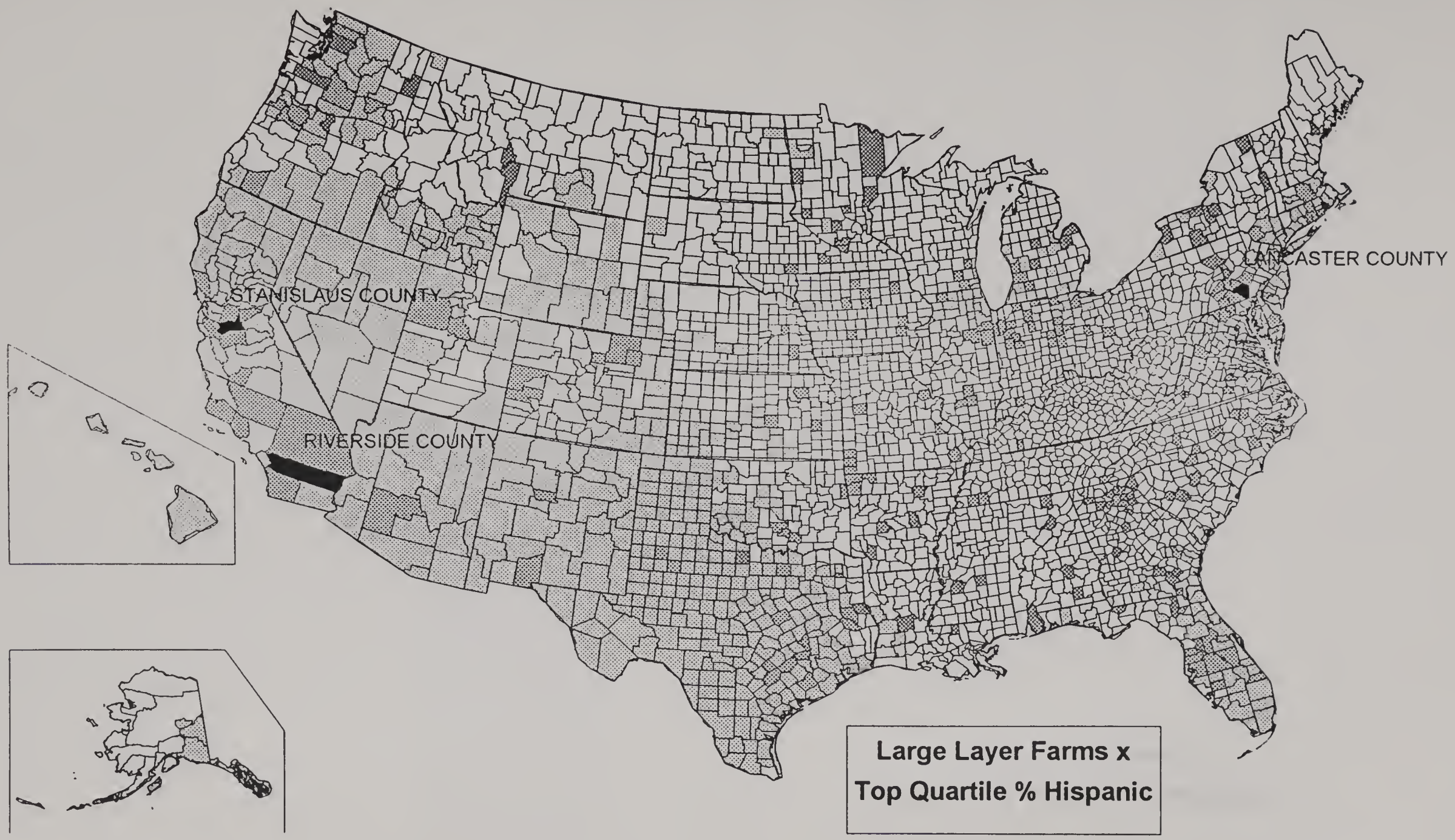
Map Shading for Coincidence Indicators

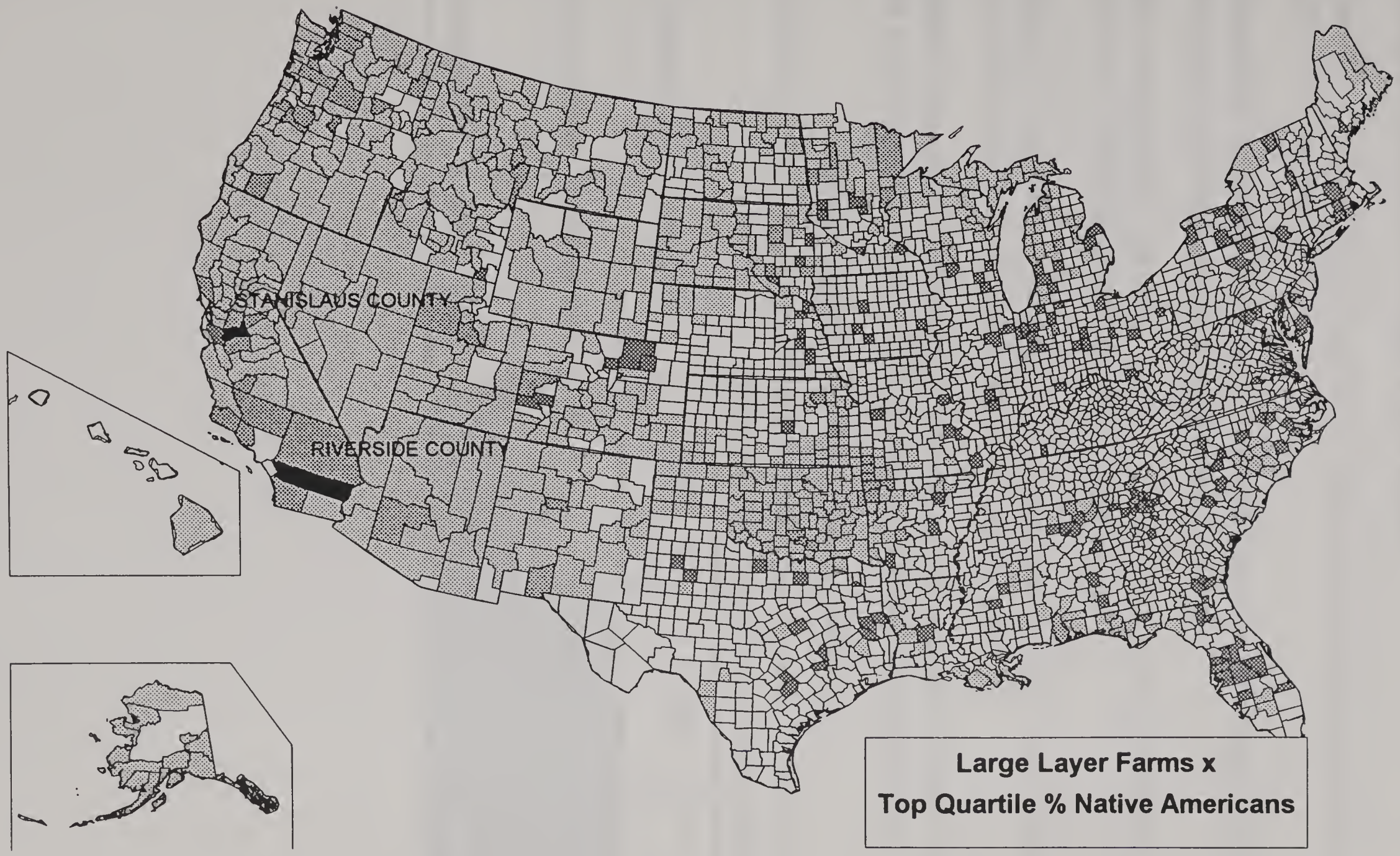
Coincidence Category		Large Layer Farms		
		None	1 to ten	11 or more
Socioeconomic	Middle 50%	No Coincidence	Some-Some	Some-Many
Variable	Upper 25%	Many-None	Many-Some	Many-Many


RIVERSIDE COUNTY
Large Layer Farms x
Top Quartile % Poverty Families


STANISLAUS COUNTY
RIVERSIDE COUNTY
Large Layer Farms x
'80-'92 Population Change


LANCASTER COUNTY
RIVERSIDE COUNTY
Large Layer Farms x
Top Quartile % Black


STANISLAUS COUNTY
RIVERSIDE COUNTY
LANCASTER COUNTY
Large Layer Farms x
Top Quartile % Hispanic



Large Layer Farms x
Top Quartile % Native Americans

- **Change in Number of Large Layer Farms.**

  Poverty. Change in the number of layer farms did not coincide with high levels of poverty.

  Population Change. Change in the number of layer farms did not coincide with high levels of population change.

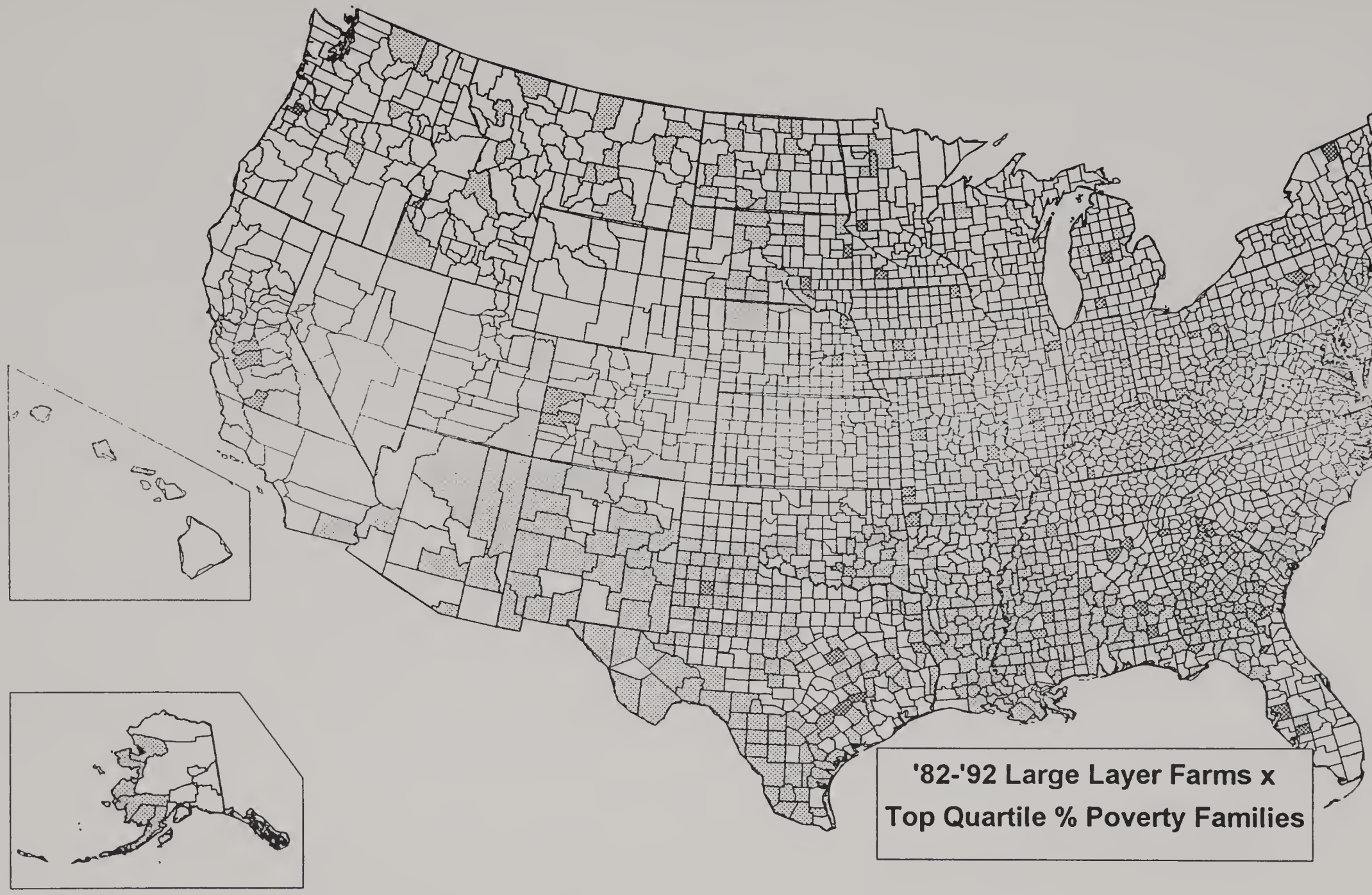
  Black Population. Change in the number of layer farms did not coincide with high levels of Black population.

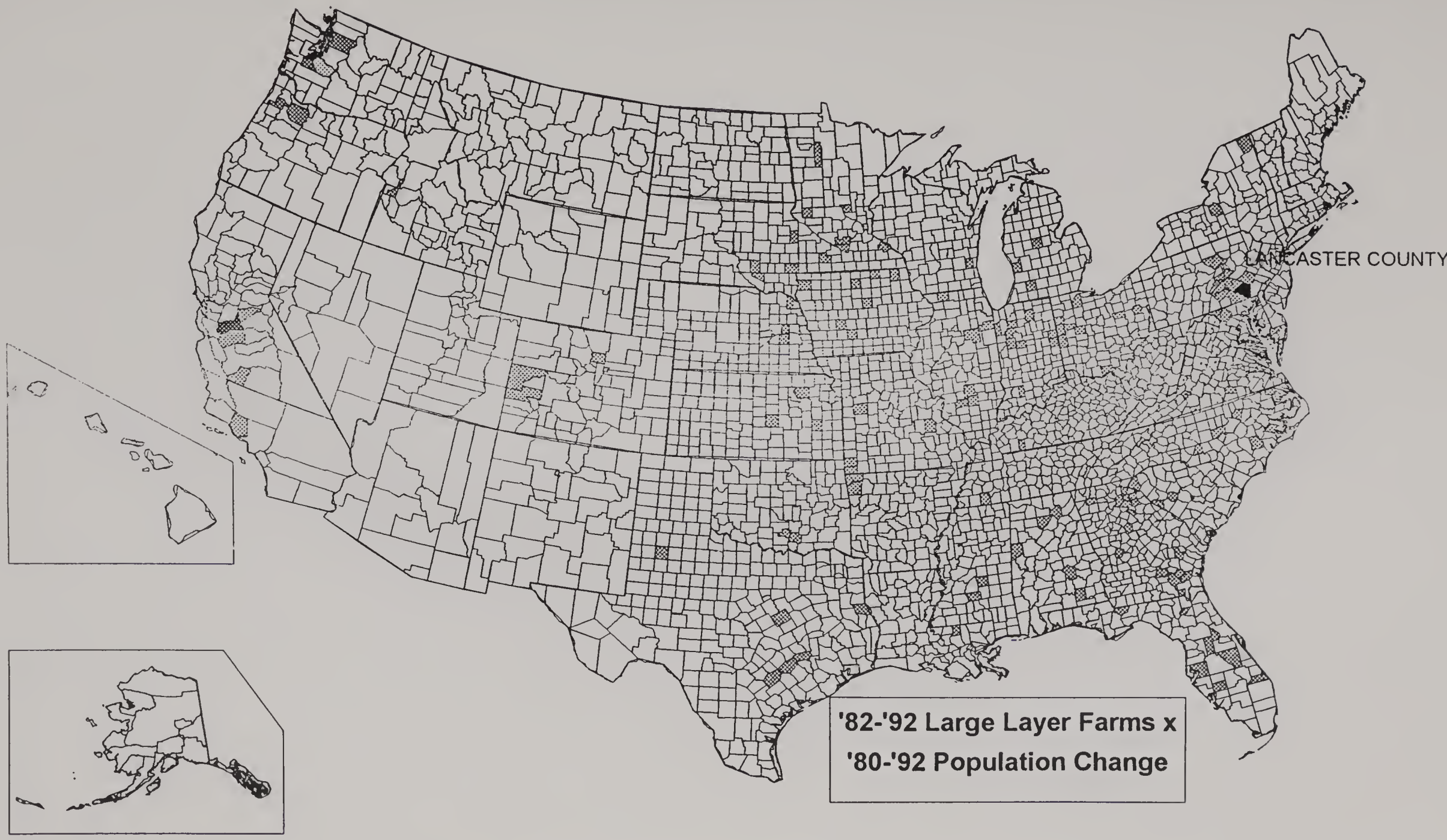
  Hispanic Population. Change in the number of layer farms did not coincide with high levels of Hispanic population.

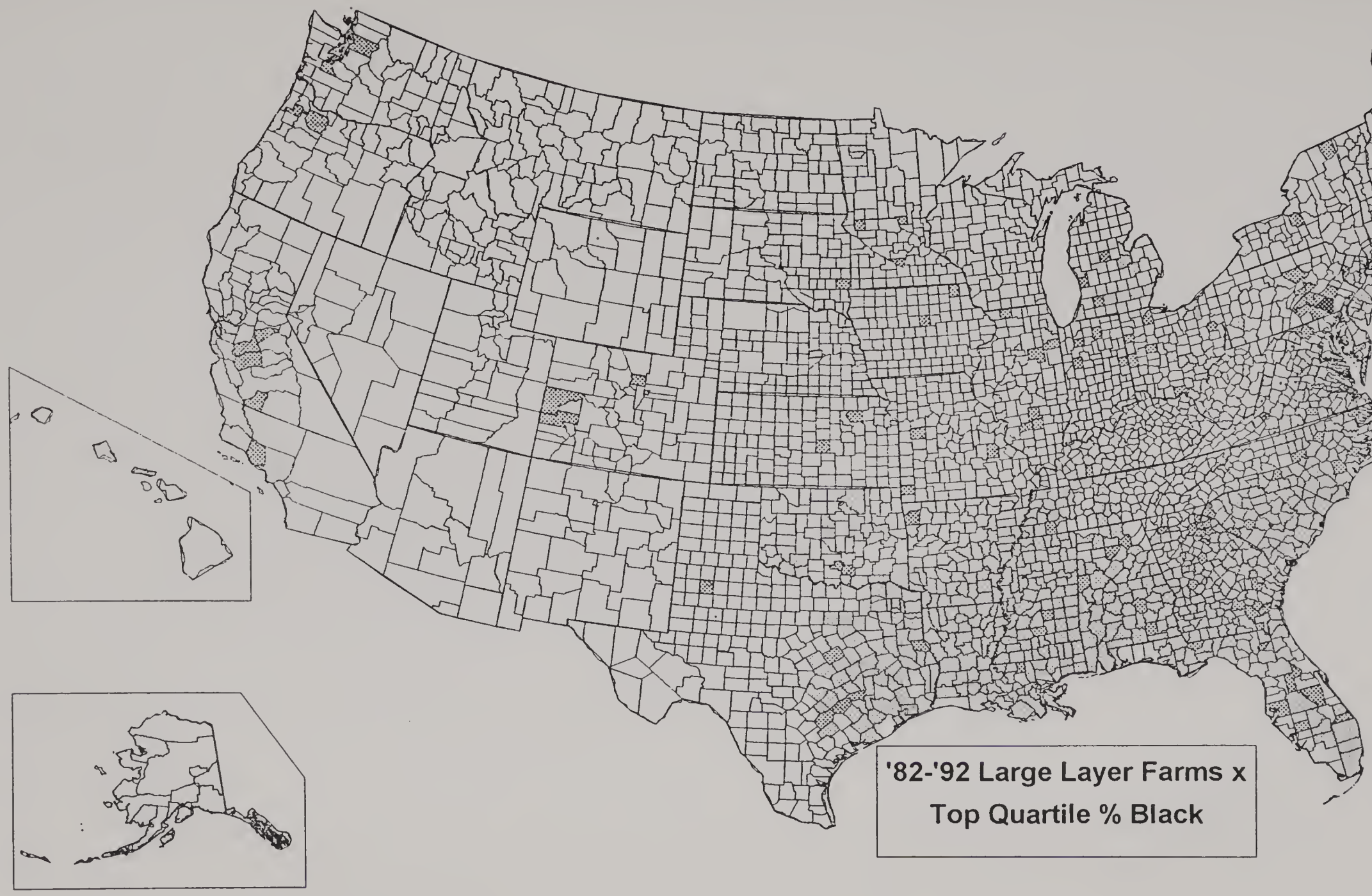
  Native American Population. Change in the number of layer farms did not coincide with high levels of Native American population.

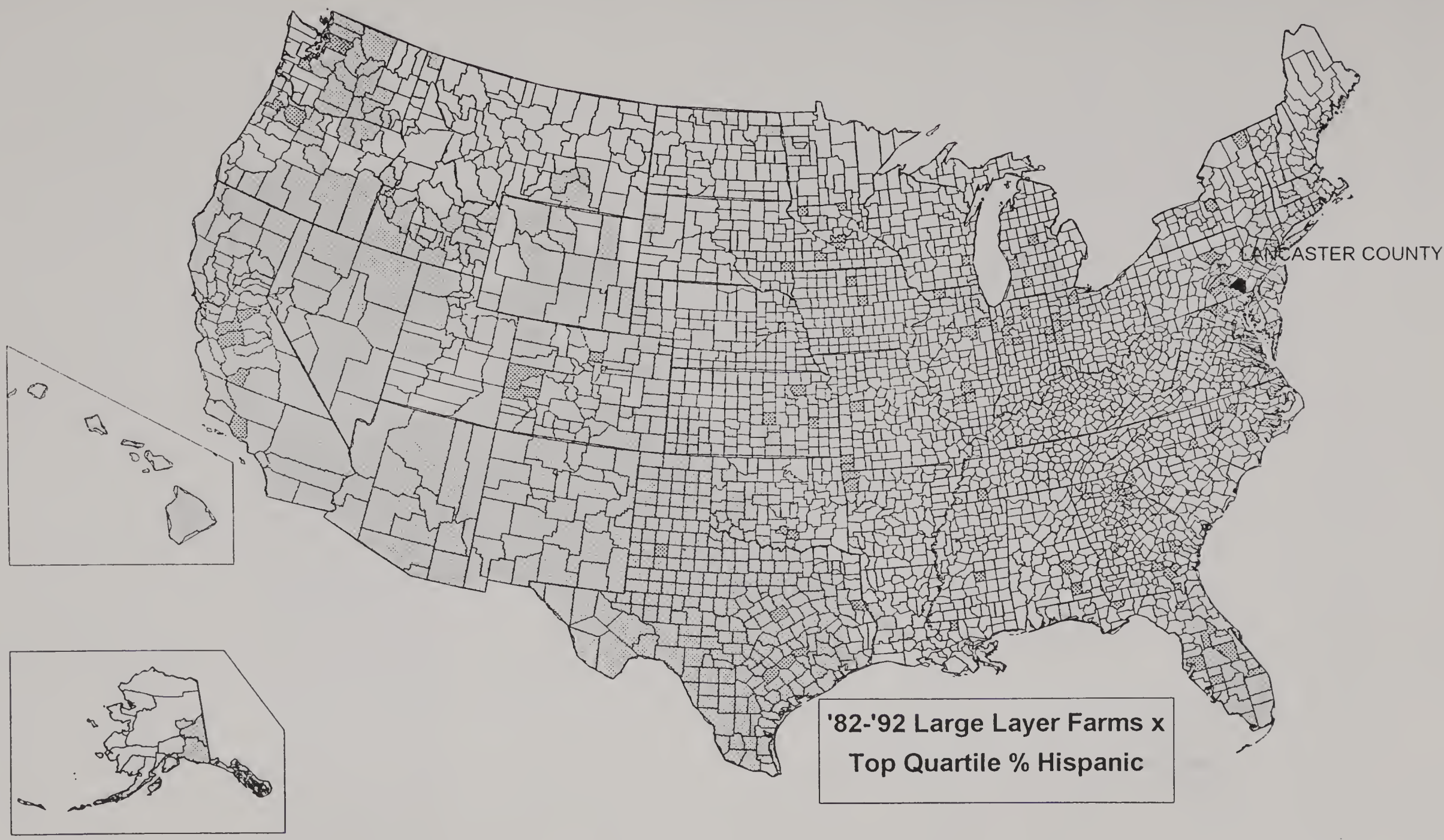
Map Shading for Coincidence Indicators

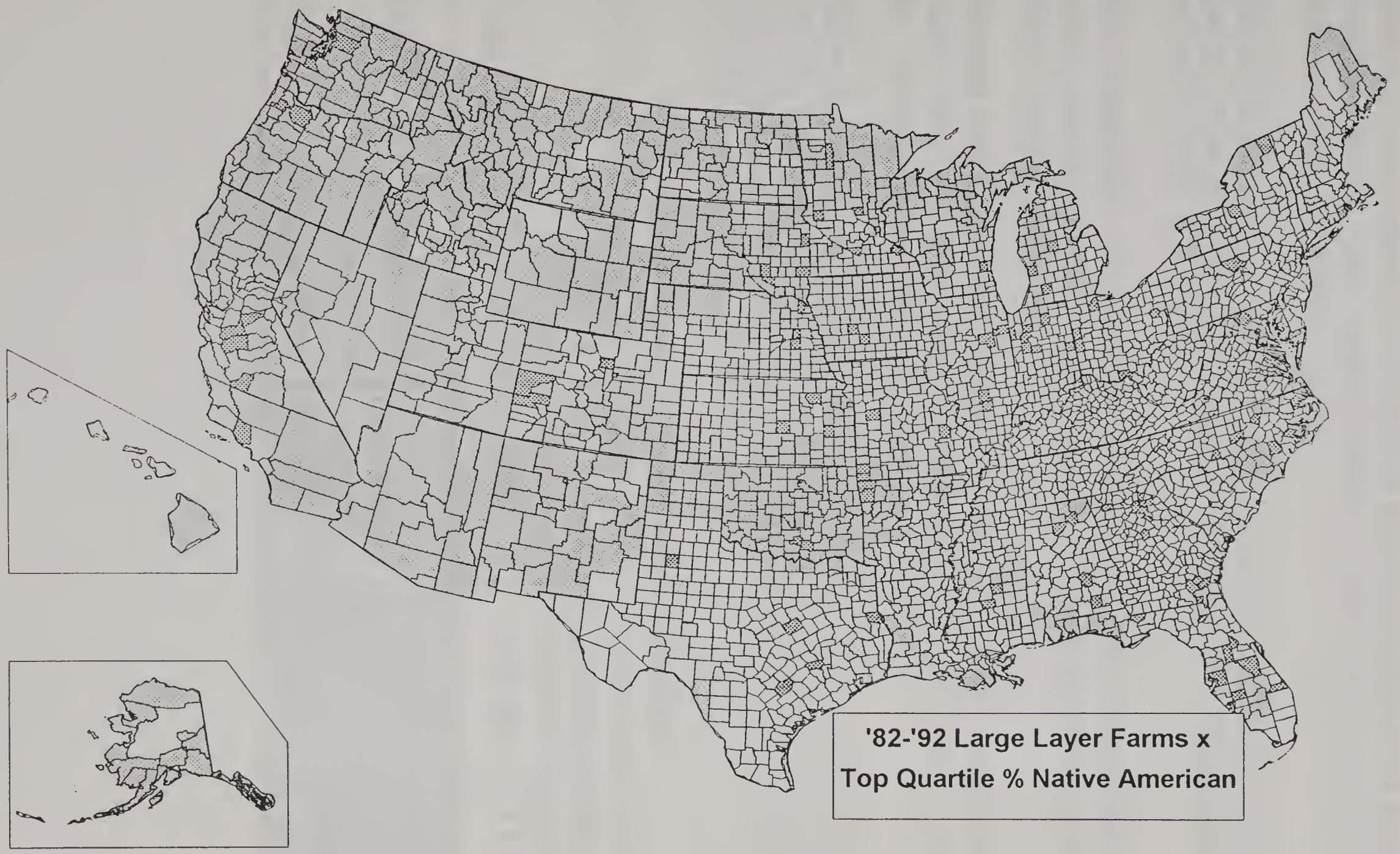
Coincidence Category		Change in Number of Large Layer Farms		
		None	1 to ten	11 or more
Socioeconomic	Middle 50%	No Coincidence	Some-Some	Some-Many
Variable	Upper 25%	Many-None	Many-Some	Many-Many


'82-'92 Large Layer Farms x
Top Quartile % Poverty Families


LANCASTER COUNTY
'82-'92 Large Layer Farms x
'80-'92 Population Change


'82-'92 Large Layer Farms x
Top Quartile % Black


LANCASTER COUNTY
'82-'92 Large Layer Farms x
Top Quartile % Hispanic



'82-'92 Large Layer Farms x
Top Quartile % Native American

- **Number of Turkey Farms.**

  Poverty. The presence of more than 50 turkey farms in a county coincided with a high quartile poverty county in only one place – Sampson County, North Carolina.

  Population Change. The presence of more than 50 turkey farms in a county coincided with high population growth in a disparate set of counties across the U.S.

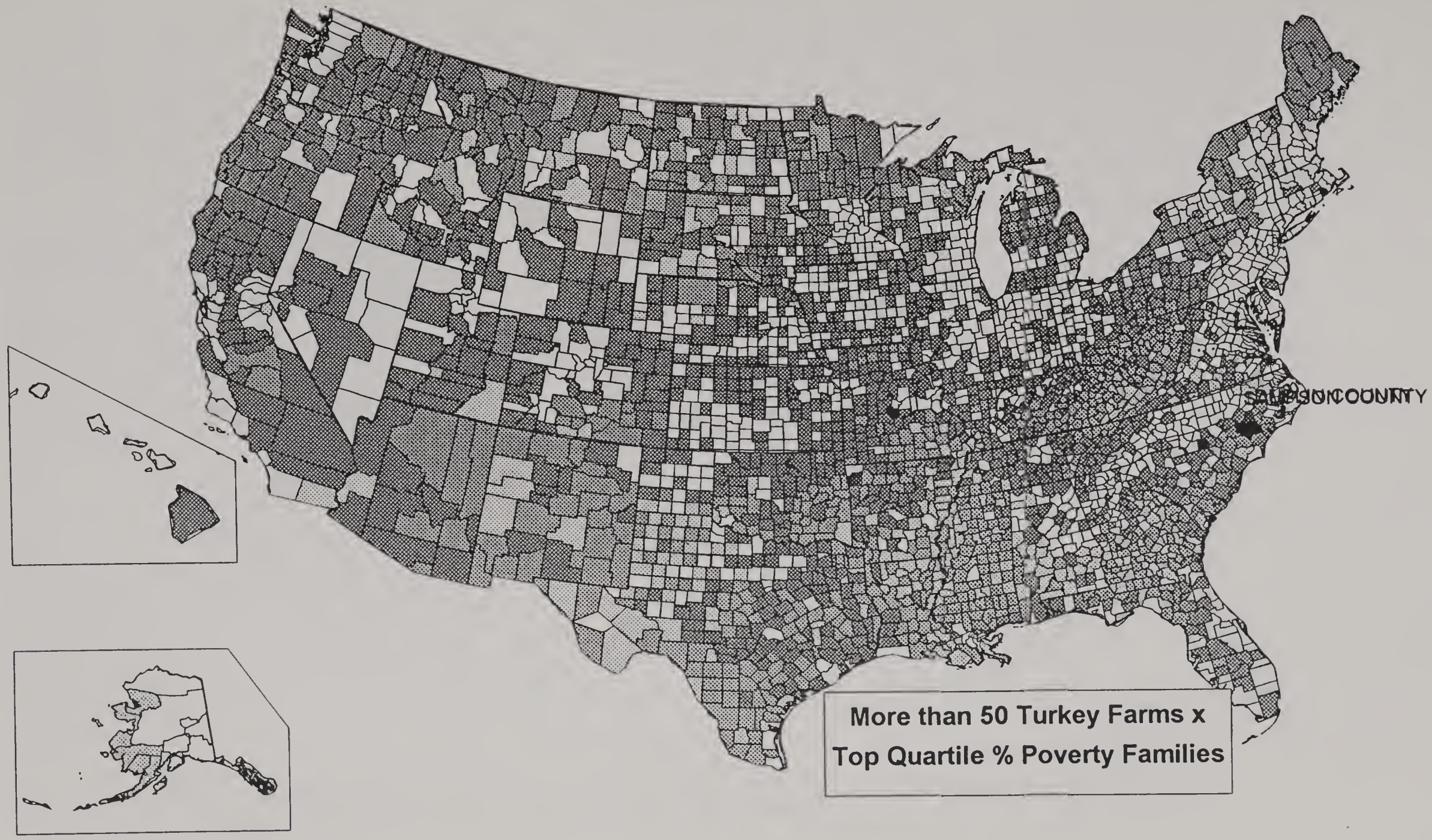
  Black Population. The presence of more than 50 turkey farms in a county coincided with the top quartile of Black population in four North Carolina counties.

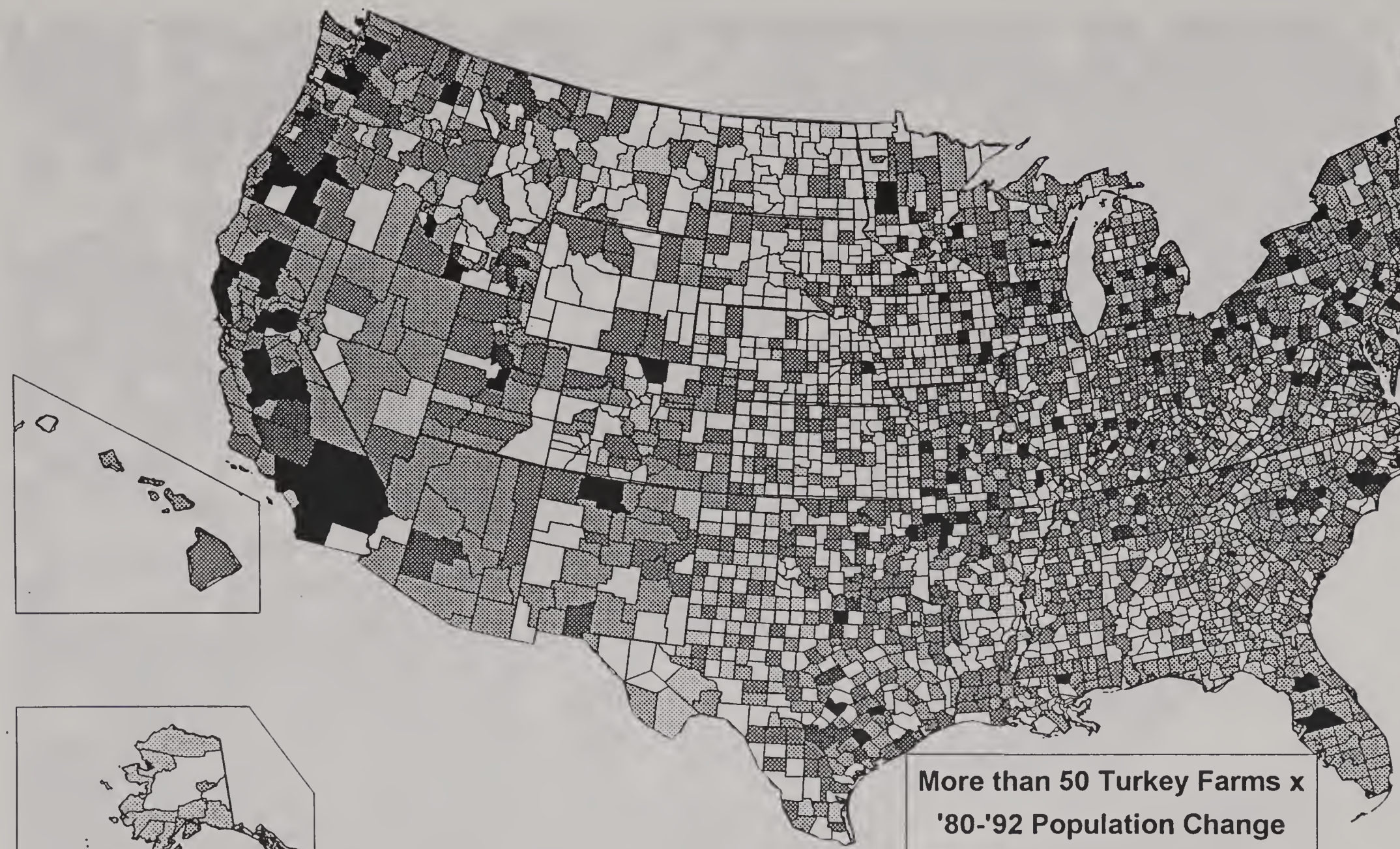
  Hispanic Population. The presence of more than 50 turkey farms in a county coincided with a high quartile Hispanic population in only a few counties in the Midwest and East.

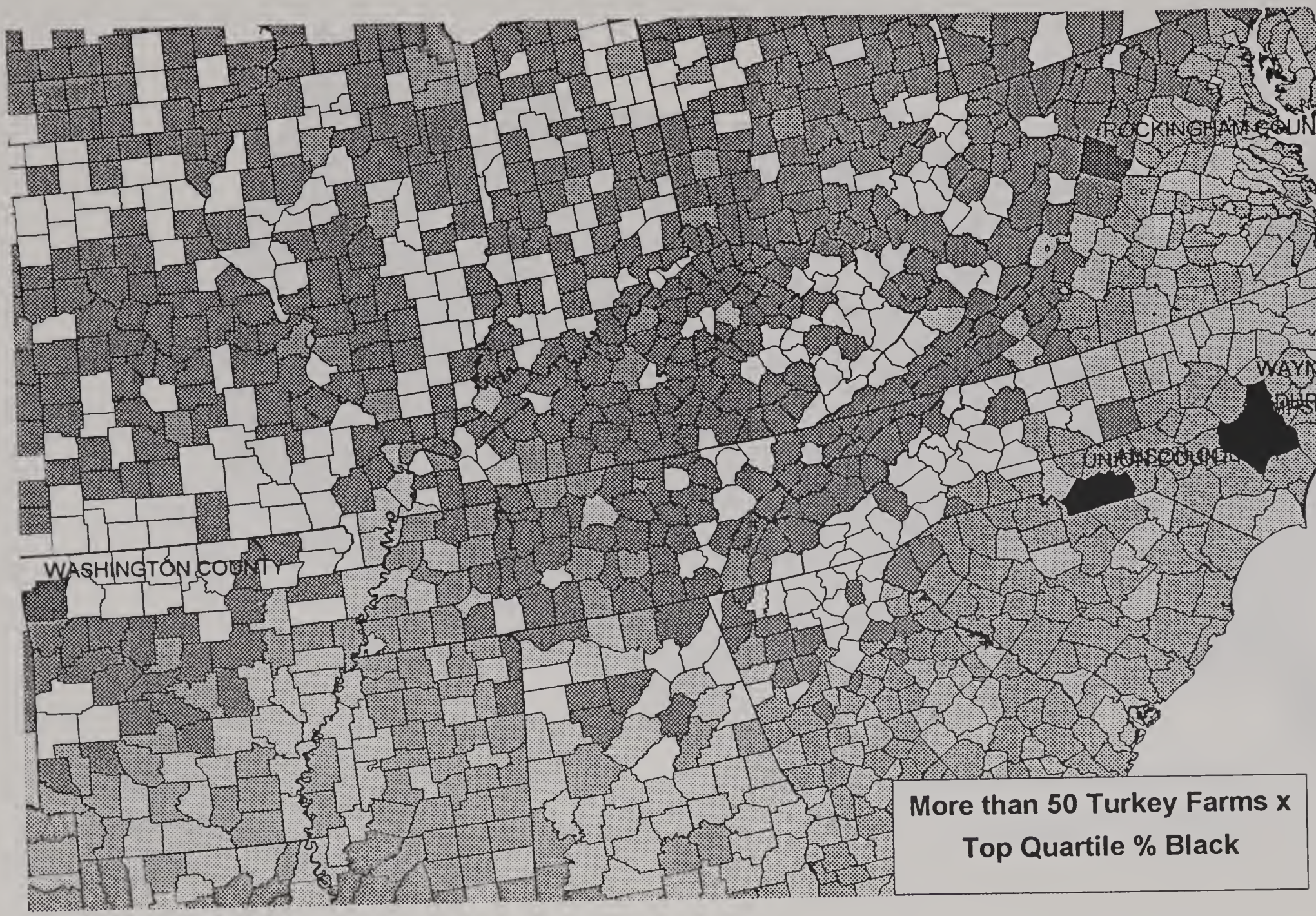
  Native American Population. The presence of more than 50 turkey farms in a county coincided with a high quartile Native American county in Benton County, Missouri; Washington Country, Arkansas, and Sampson County, North Carolina.

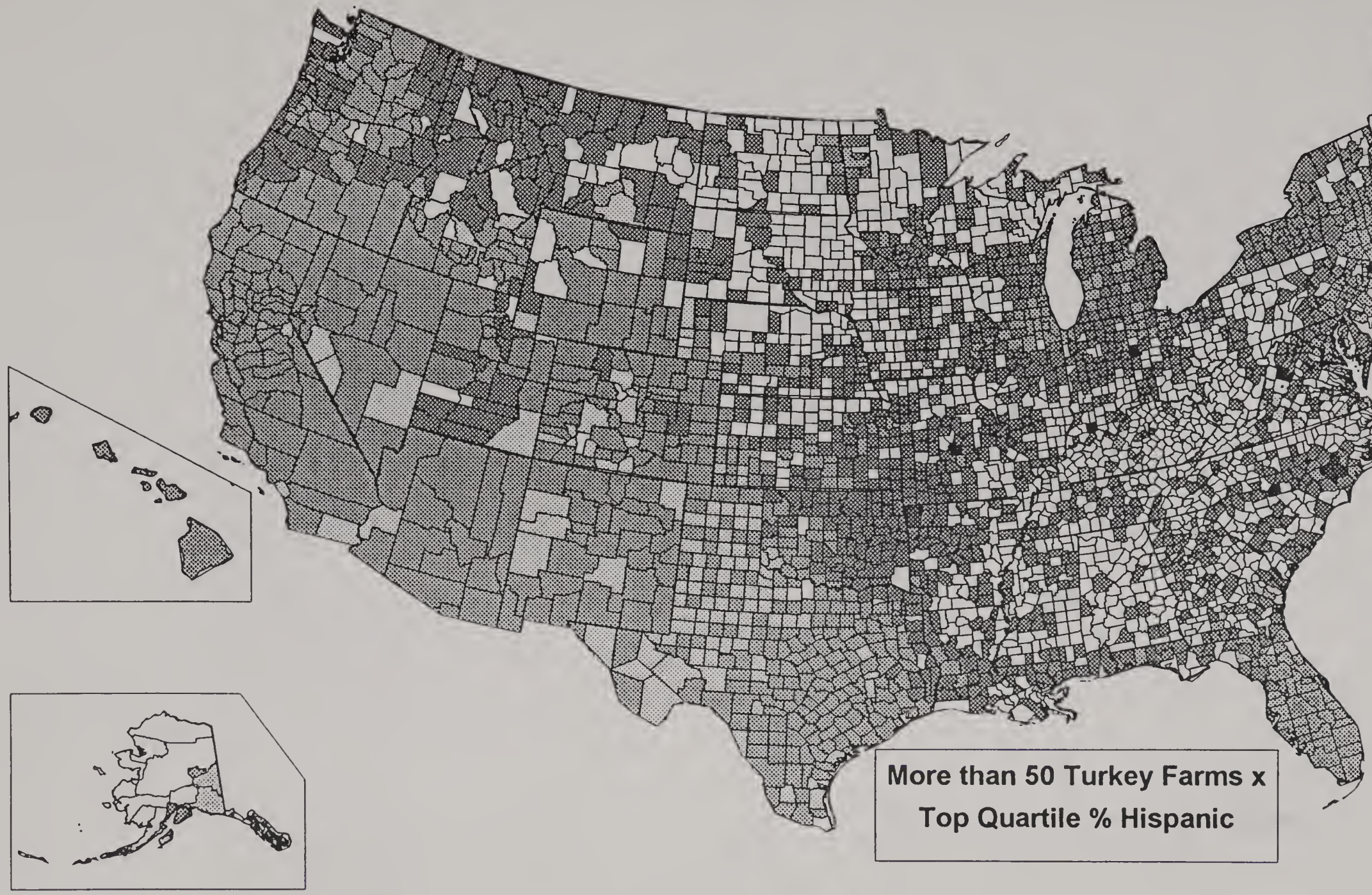
Map Shading for Coincidence Indicators

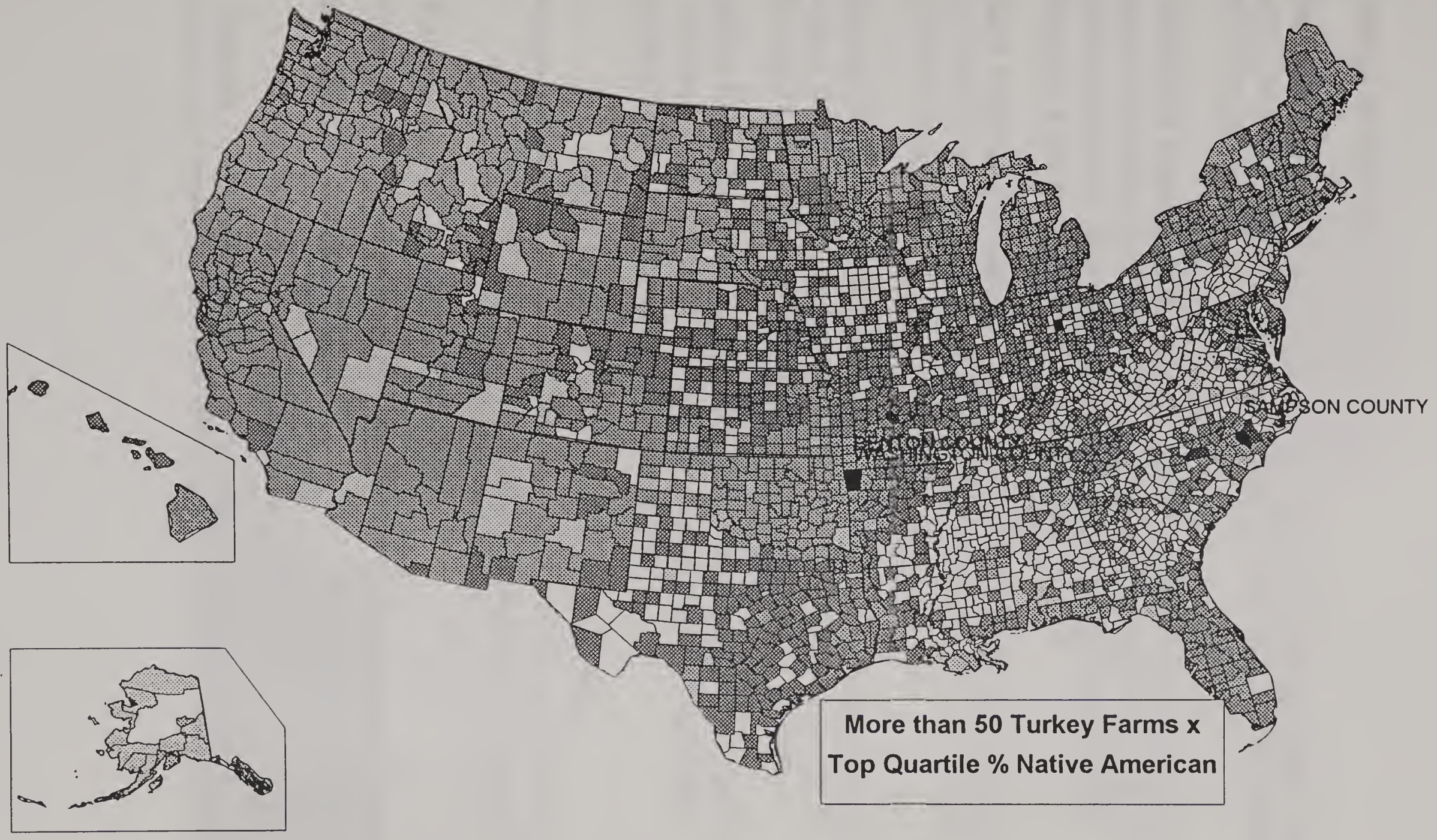
Coincidence Category		Number of Turkey Farms		
		None	1 to ten	11 or more
Socioeconomic	Middle 50%	No Coincidence	Some-Some	Some-Many
Variable	Upper 25%	Many-None	Many-Some	Many-Many


SALINE COUNTY
More than 50 Turkey Farms x
Top Quartile % Poverty Families


More than 50 Turkey Farms x
'80-'92 Population Change


ROCKINGHAM COUNTY
WAYNE COUNTY
DUPLIN COUNTY
ROBESON COUNTY
UNION COUNTY
WASHINGTON COUNTY
More than 50 Turkey Farms x
Top Quartile % Black


More than 50 Turkey Farms x
Top Quartile % Hispanic


SAMPSON COUNTY
BEAUFORT COUNTY
WASHINGTON COUNTY
More than 50 Turkey Farms x
Top Quartile % Native American

- **Change in Number of Turkey Farms**

  Poverty. Growth of more than 50 turkey farms in a county coincided with the top quartile of poverty population in Sampson County, North Carolina.

  Population Change. Growth of more than 50 turkey farms in a county coincided with the top quartile of population change in: Onslow County, North Carolina; Marion County Florida; and Missouri's Benton and Franklin Counties.

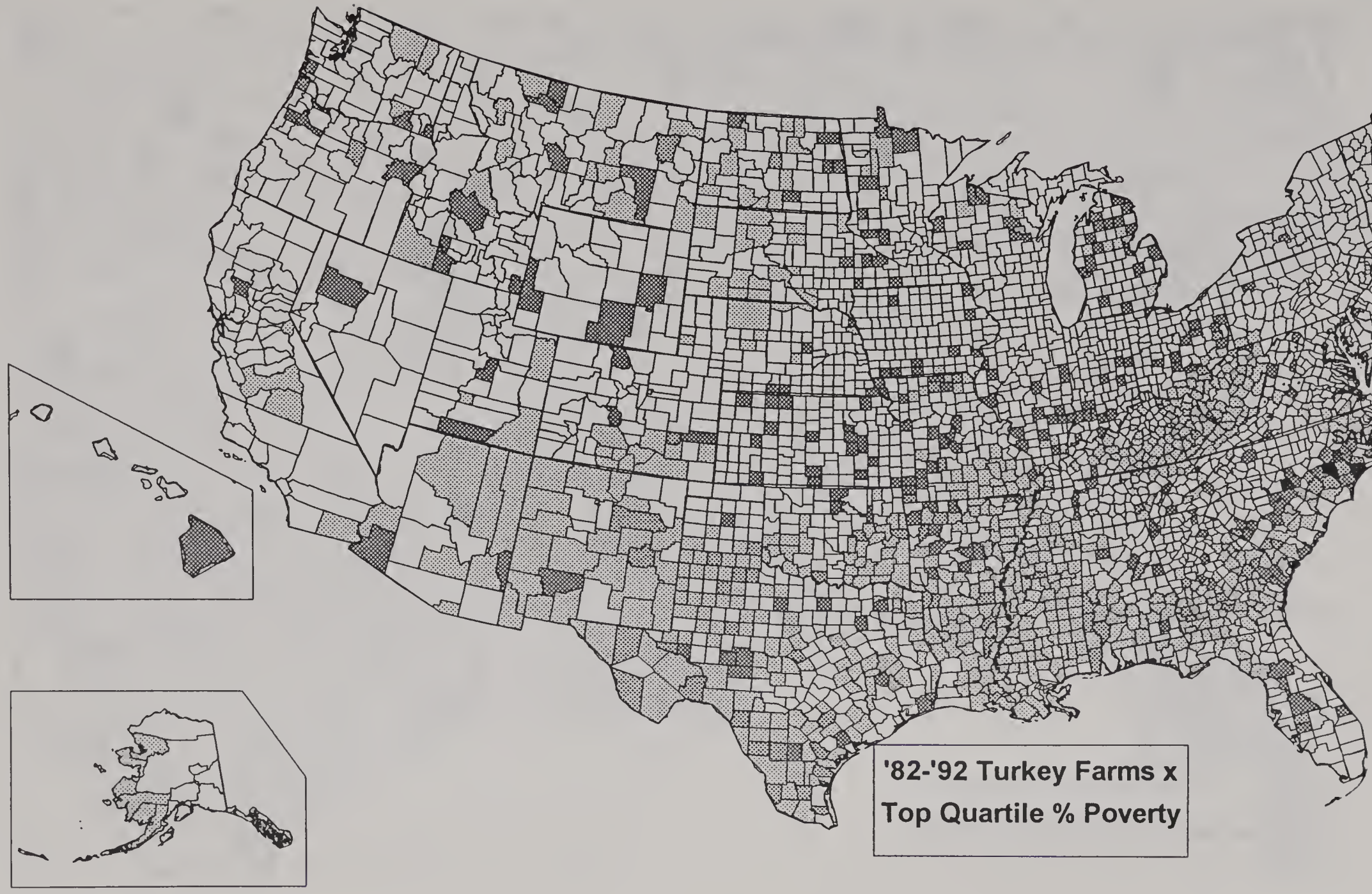
  Black Population. Growth of more than 50 turkey farms in a county coincided with the top quartile of Black population in four North Carolina counties

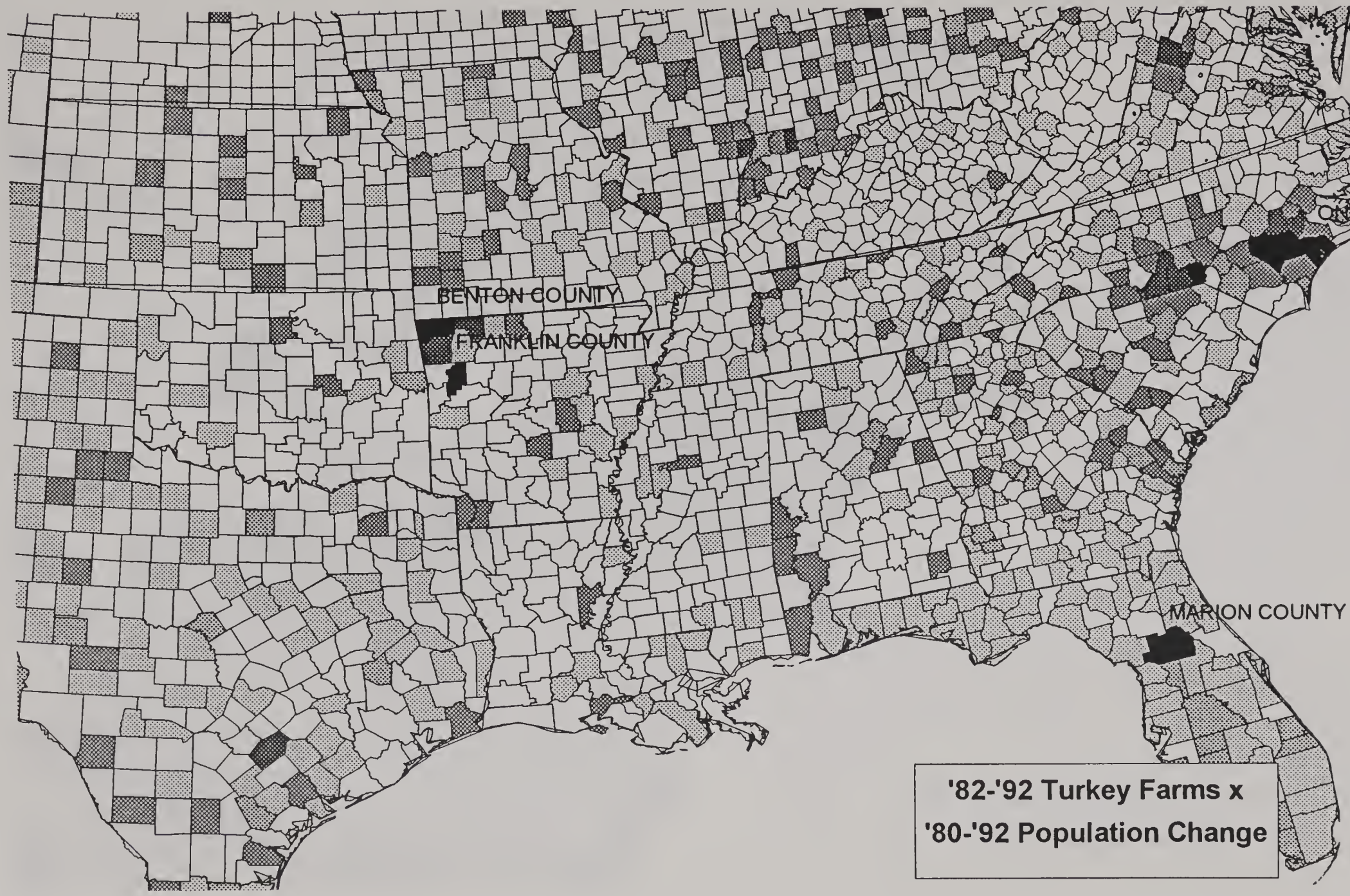
  Hispanic Population. Growth of more than 50 turkey farms in a county coincided with the top quartile of Hispanic population in Sampson County, North Carolina and one Virginia county.

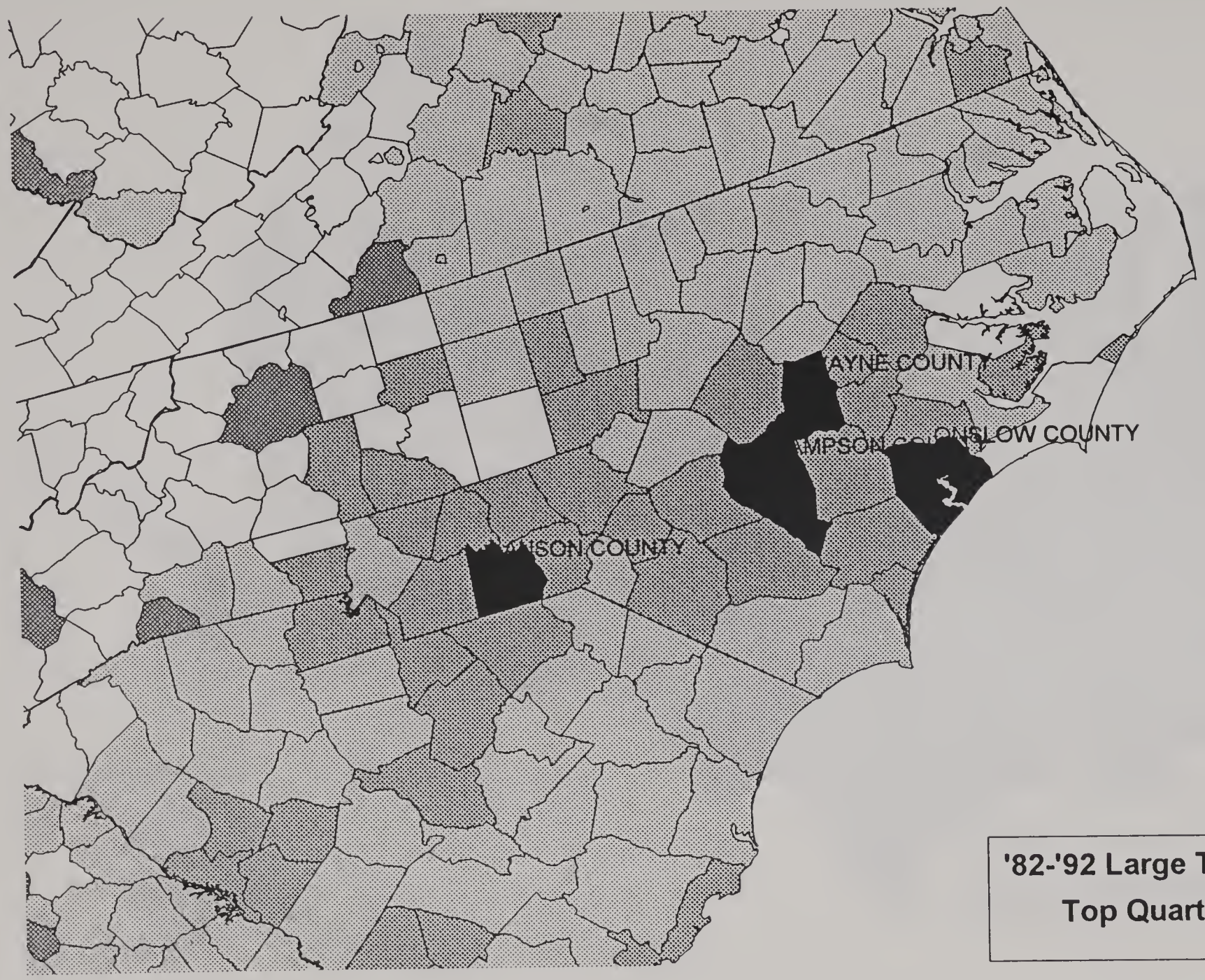
  Native American Population. Growth of more than 50 turkey farms in a county coincided with the top quartile of Native American population in four North Carolina counties.

Map Shading for Coincidence Indicators

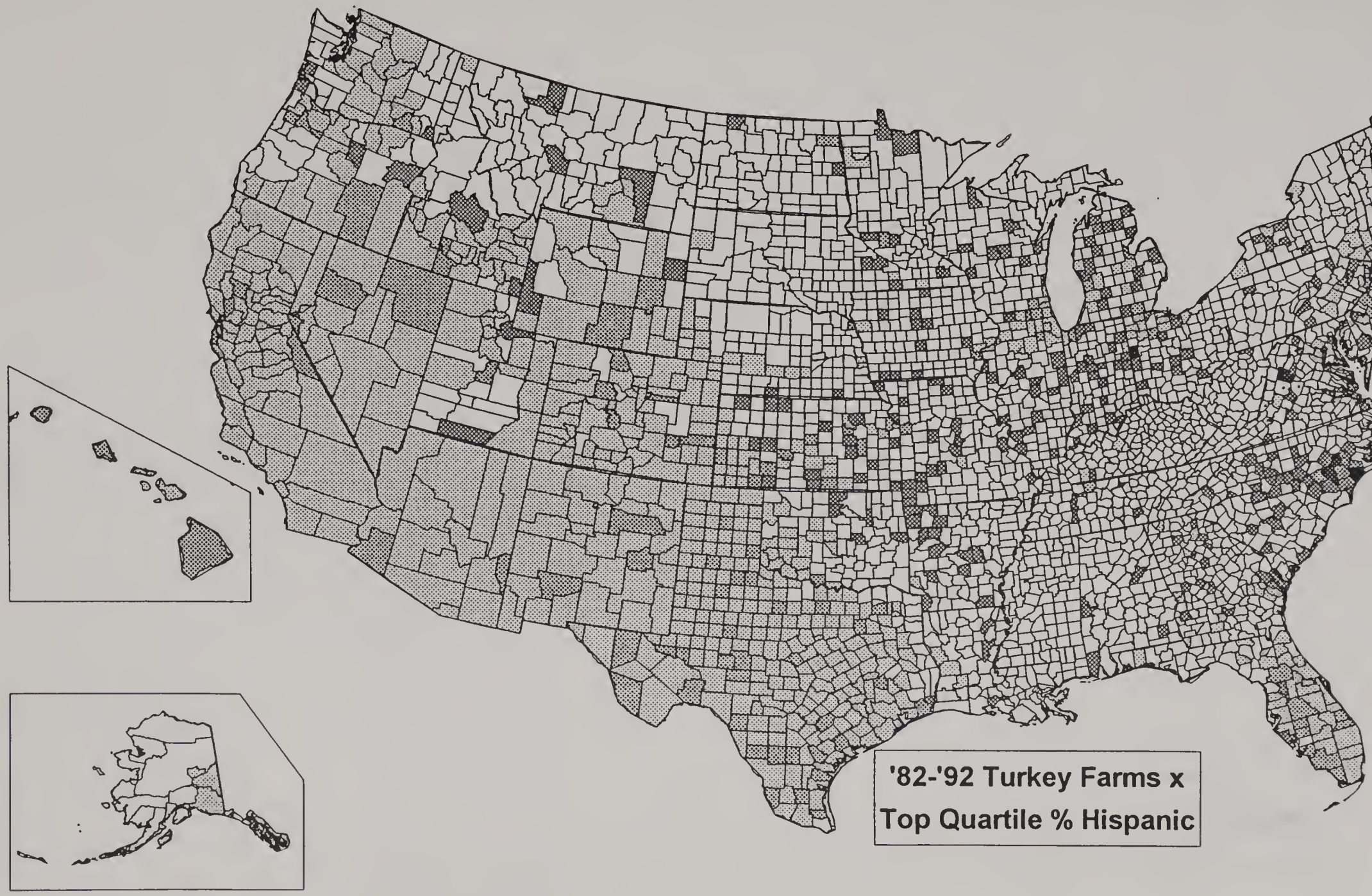
Coincidence Category		Change in Number of Turkey Farms		
		None	1 to ten	11 or more
Socioeconomic	Middle 50%	No Coincidence	Some-Some	Some-Many
Variable	Upper 25%	Many-None	Many-Some	Many-Many

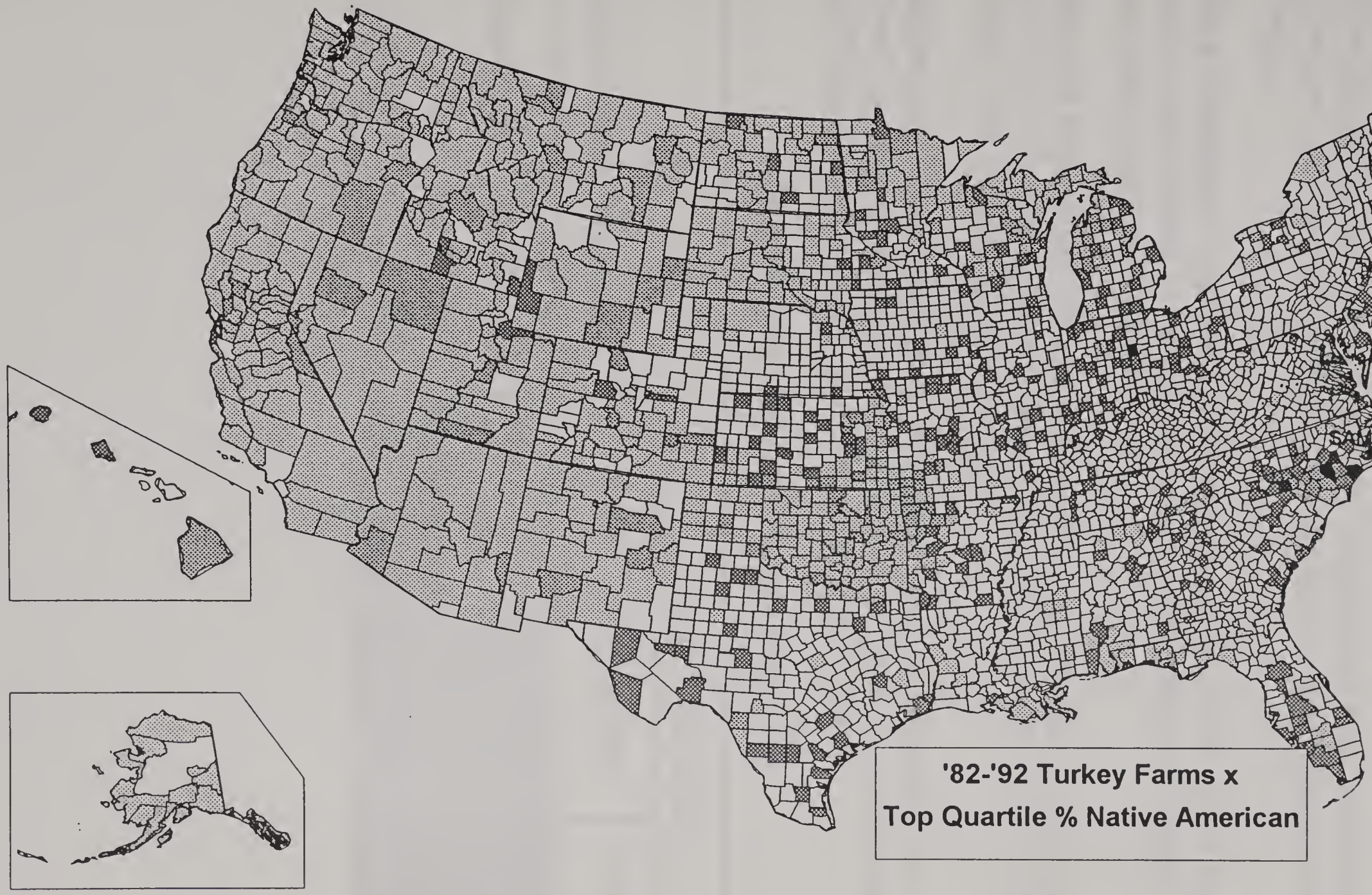

SAMPSON COUNTY
'82-'92 Turkey Farms x
Top Quartile % Poverty


ONSLOW COUNTY
BENTON COUNTY
FRANKLIN COUNTY
MARION COUNTY
'82-'92 Turkey Farms x
'80-'92 Population Change



'82-'92 Large Turkey Farms x Top Quartile % Black


'82-'92 Turkey Farms x
Top Quartile % Hispanic


SAMPSON COUNTY
'82-'92 Turkey Farms x
Top Quartile % Native American

- **Number of Large Beef Units.**

  Poverty. Poverty counties with ten or more beef cattle units tended to be located in the Western U.S.

  Population Change. High population change counties with ten or more beef cattle units tended to be located in the Western U.S. and Florida.

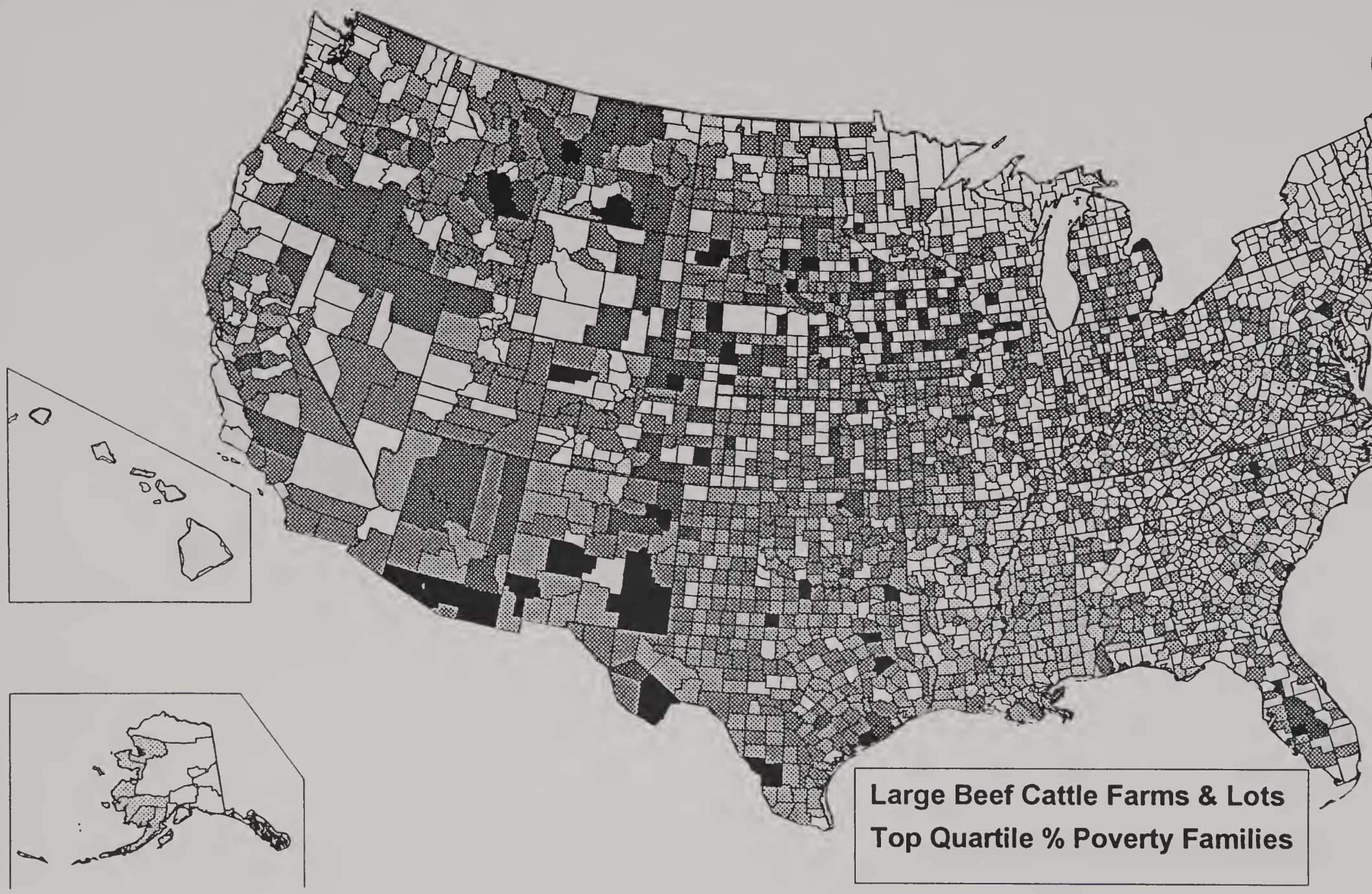
  Black Population. High and population counties with ten or more beef cattle units tended to be located in scattered areas of Florida, Texas, and some parts of the Midwest.

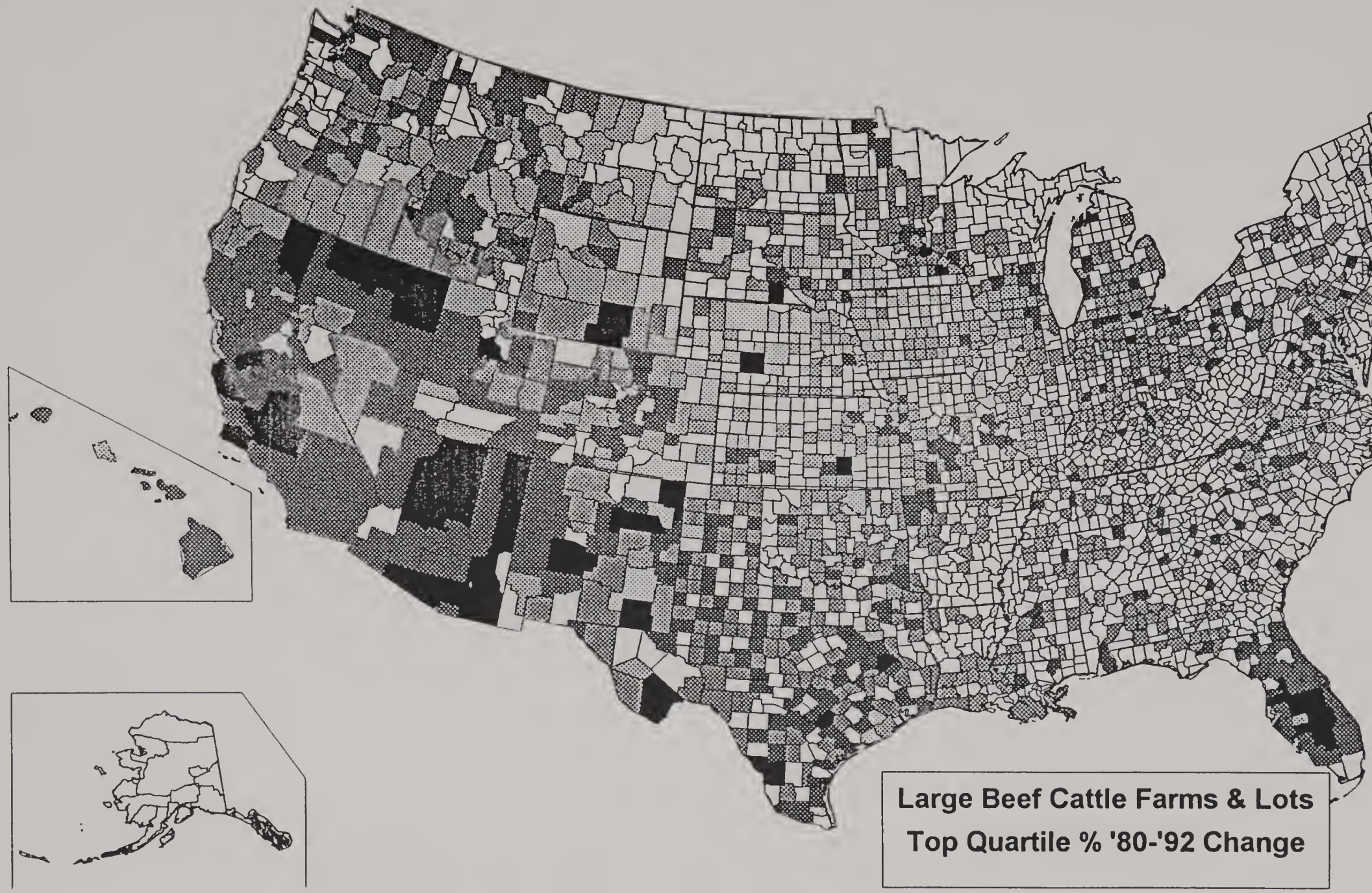
  Hispanic Population. The presence of a large Hispanic population coincided with ten or more large beef units in the Western U.S., Texas, and parts of Central Florida.

  Native American Population. The presence of a large Native American population coincided with ten or more large beef units in the Western U.S., Texas, and parts of Central Florida.

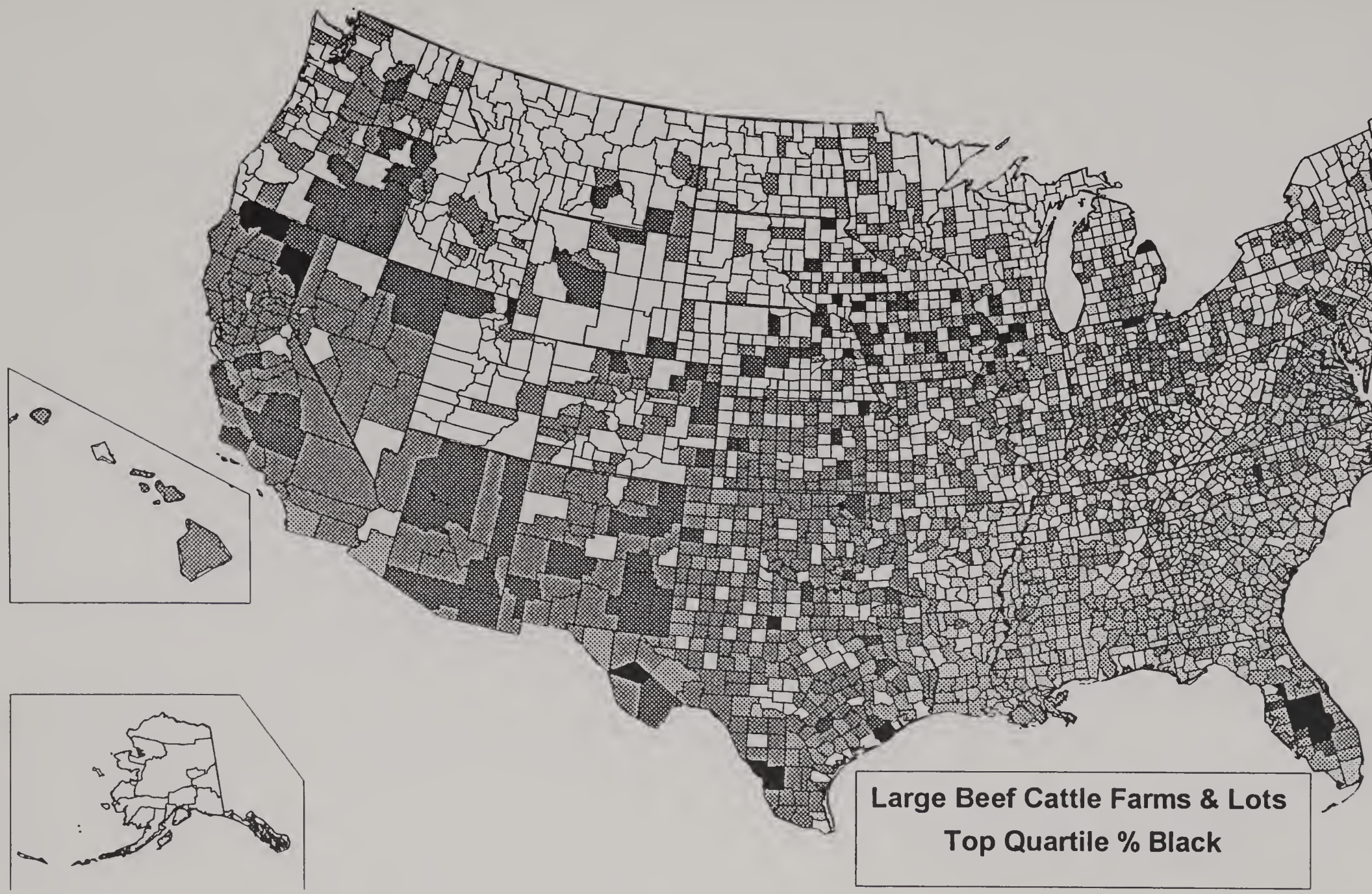
Map Shading for Coincidence Indicators

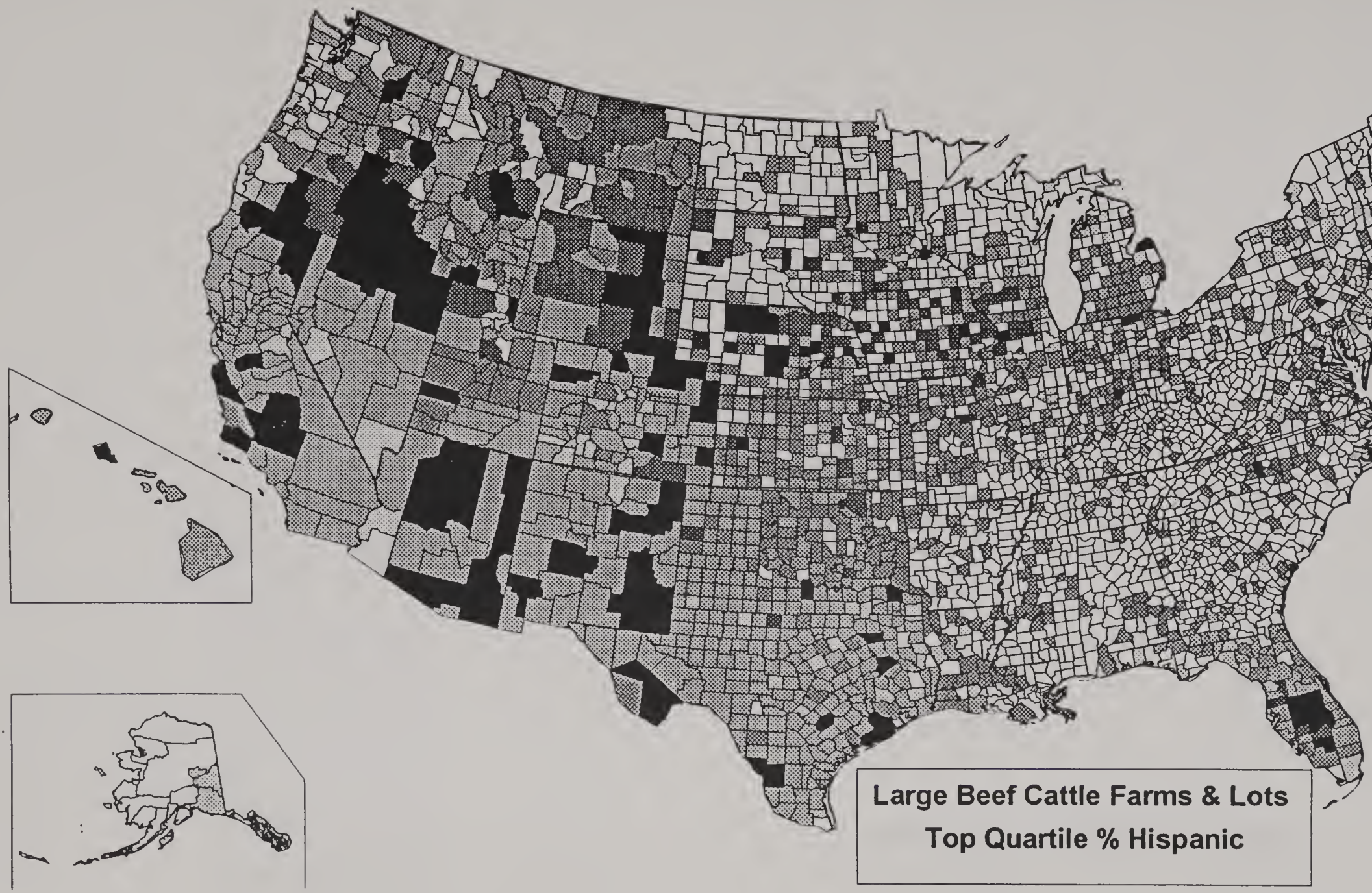
Coincidence Category		Large Beef Units		
		None	1 to ten	11 or more
Socioeconomic	Middle 50%	No Coincidence	Some-Some	Some-Many
Variable	Upper 25%	Many-None	Many-Some	Many-Many


Large Beef Cattle Farms & Lots
Top Quartile % Poverty Families

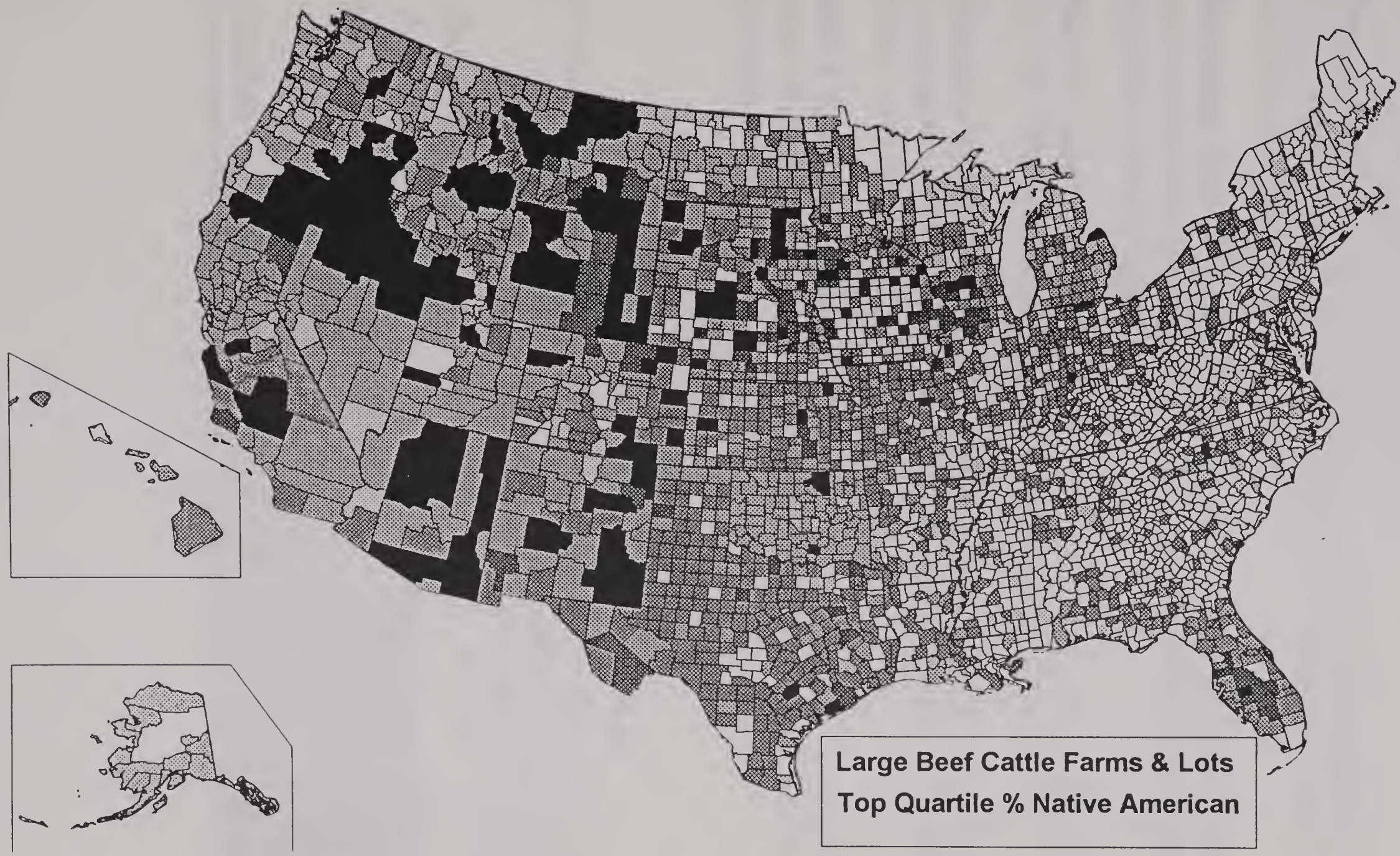


Large Beef Cattle Farms & Lots
Top Quartile % '80-'92 Change


Large Beef Cattle Farms & Lots
Top Quartile % Black



Large Beef Cattle Farms & Lots
Top Quartile % Hispanic


Large Beef Cattle Farms & Lots
Top Quartile % Native American

- **Change in Number of Large Beef Units**

  Poverty. Change in the number of large beef units tended to coincide with poverty in a few counties in the Southwest and a few counties in South Dakota and Nebraska.

  Population Change. Change in the number of large beef units tended to coincide with population change in Central Florida and several counties in the Southwest.

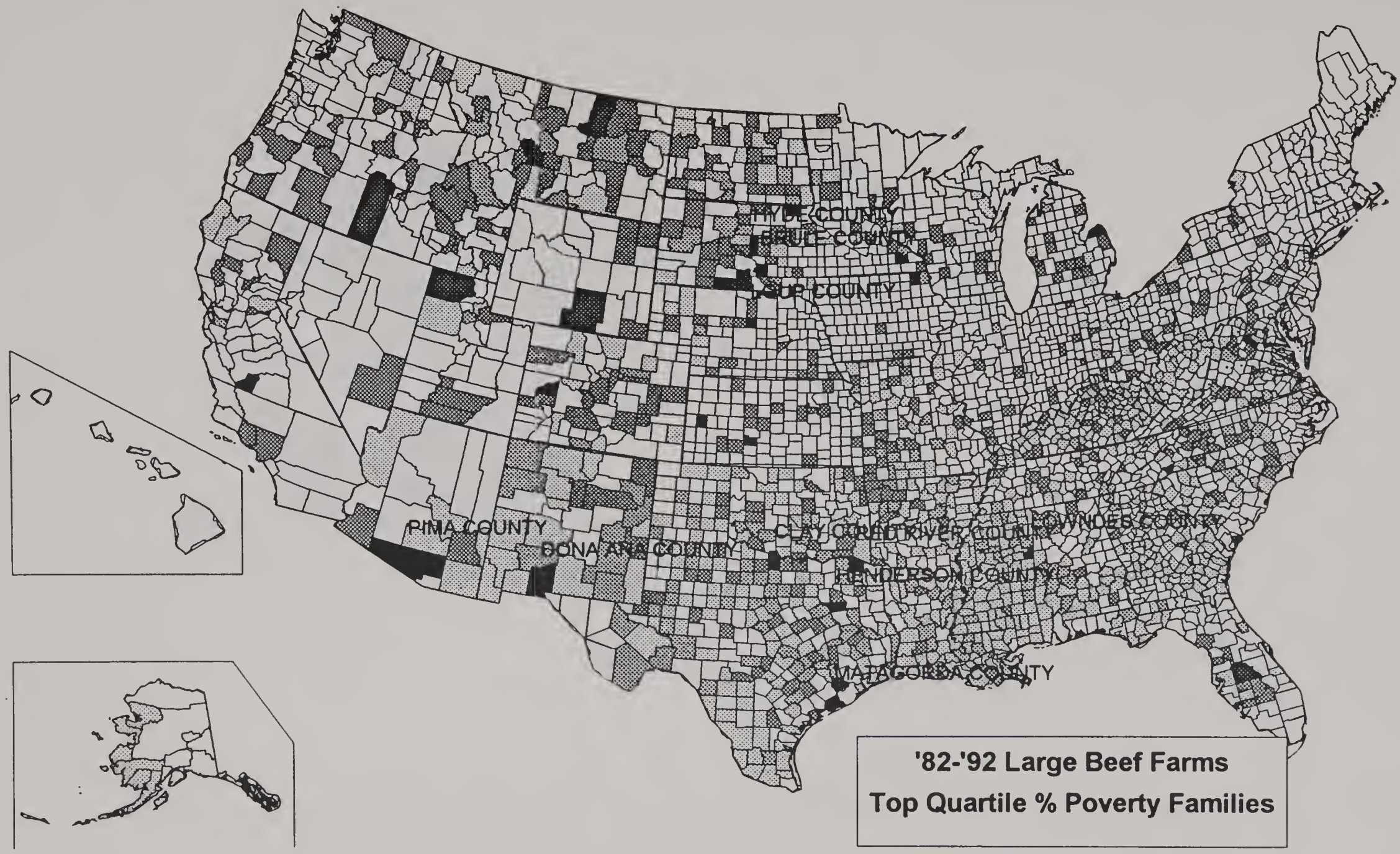
  Black Population. Change in the number of large beef units tended to coincide with and population in a few scattered counties.

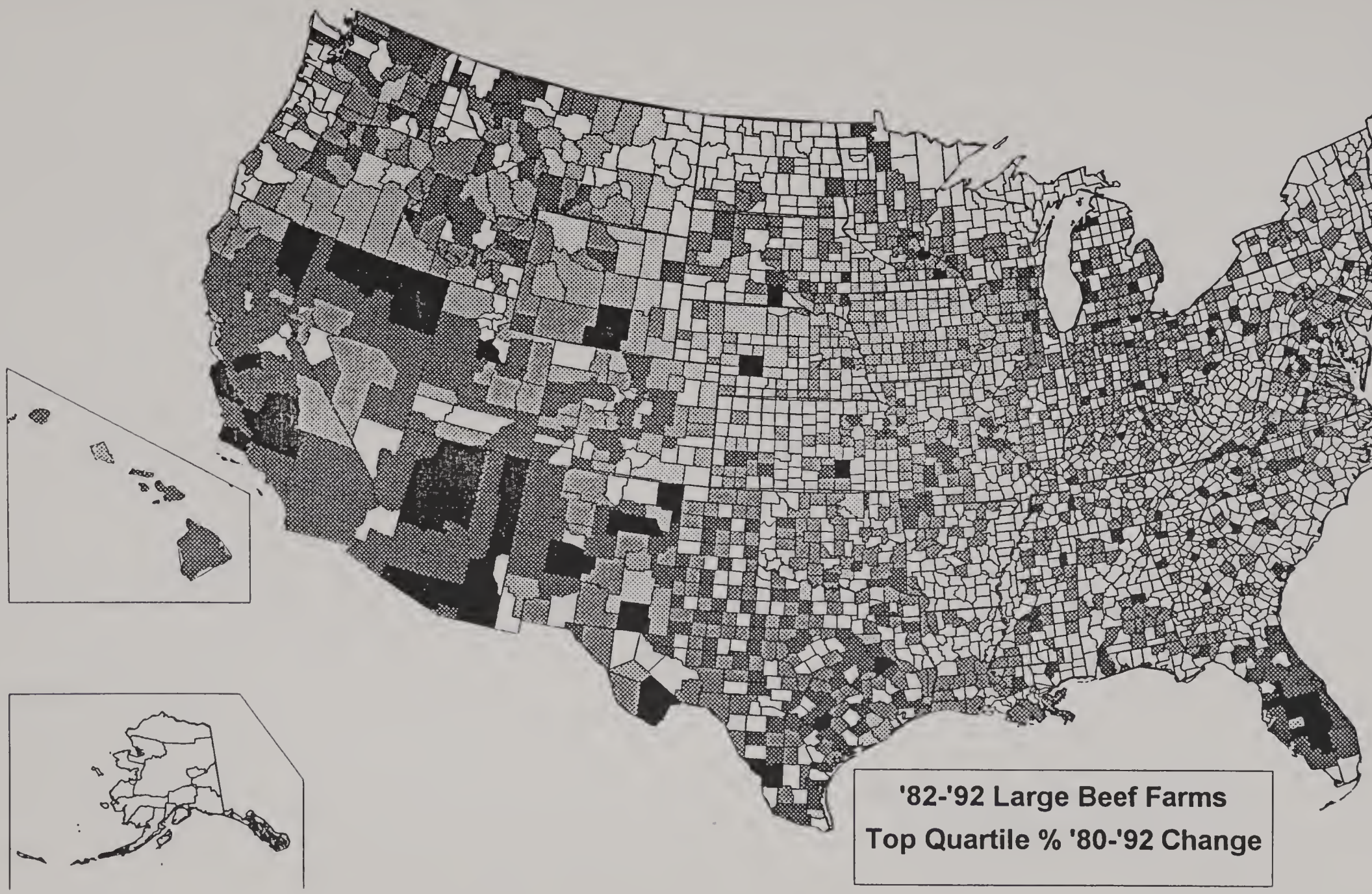
  Hispanic Population. Change in the number of large beef units tended to coincide with Hispanic population in a few counties in the Florida, Texas, and the West.

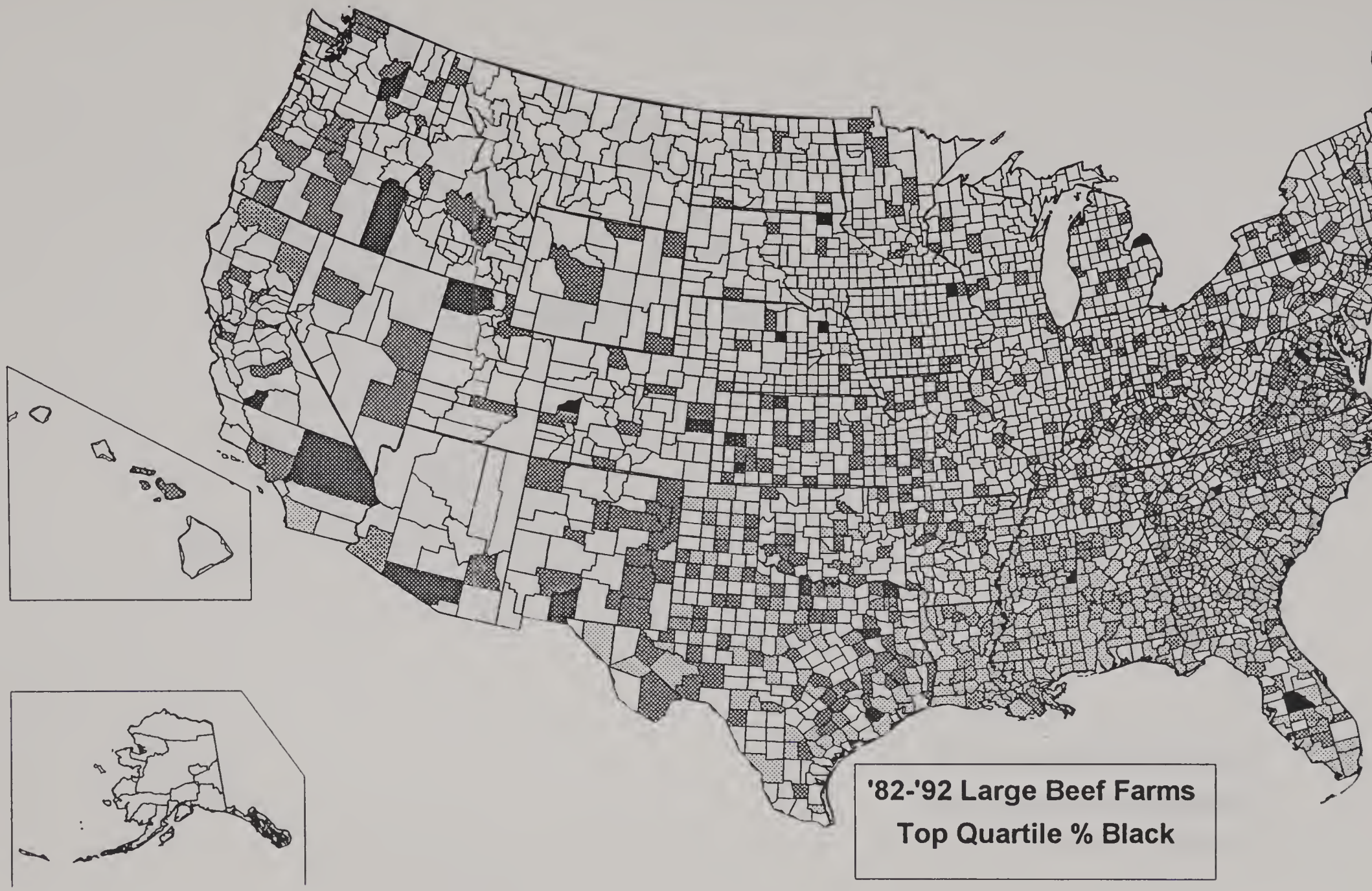
  Native American Population. Change in the number of large beef units tended to coincide with Native American population in a few counties in the West

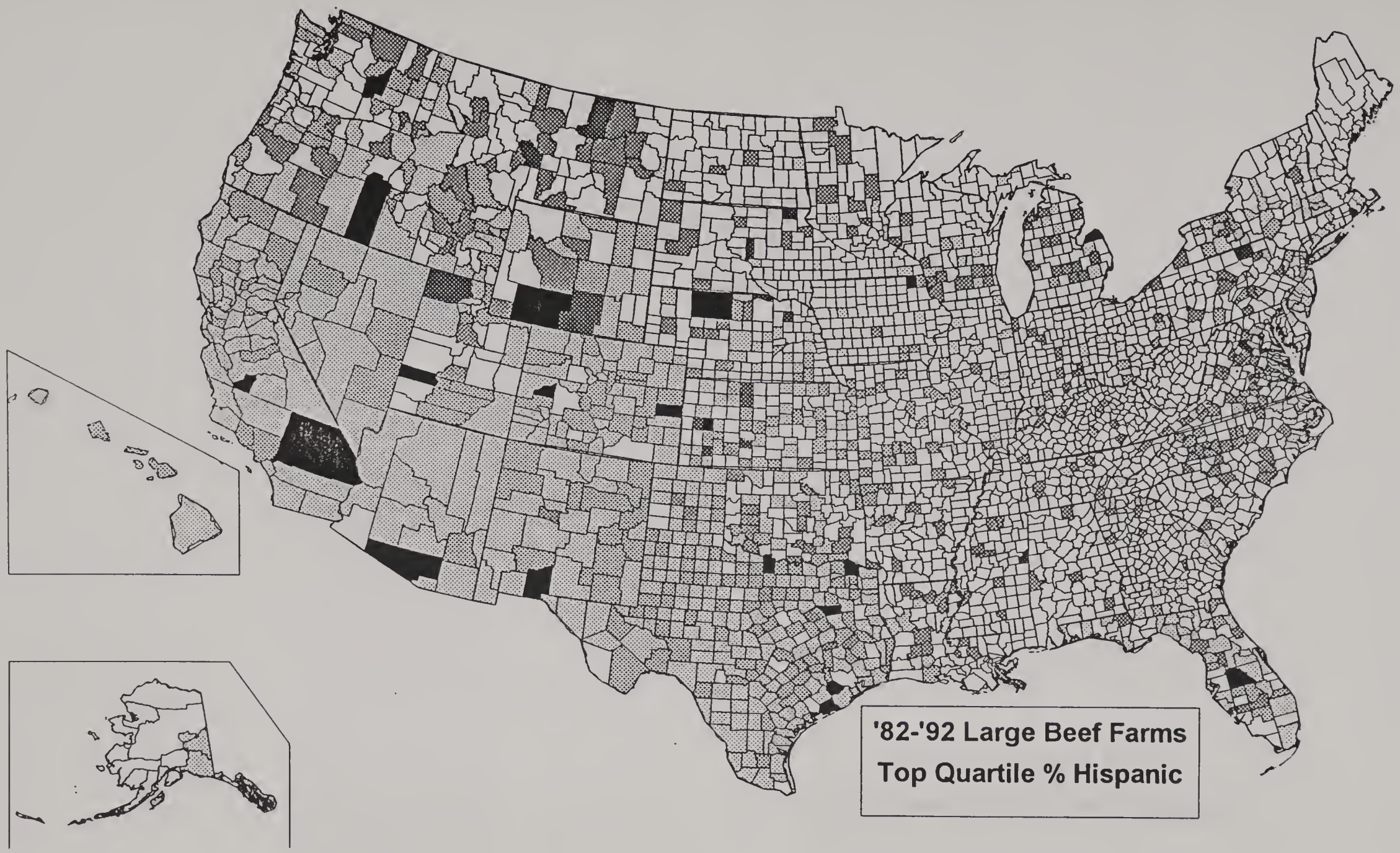
Map Shading for Coincidence Indicators

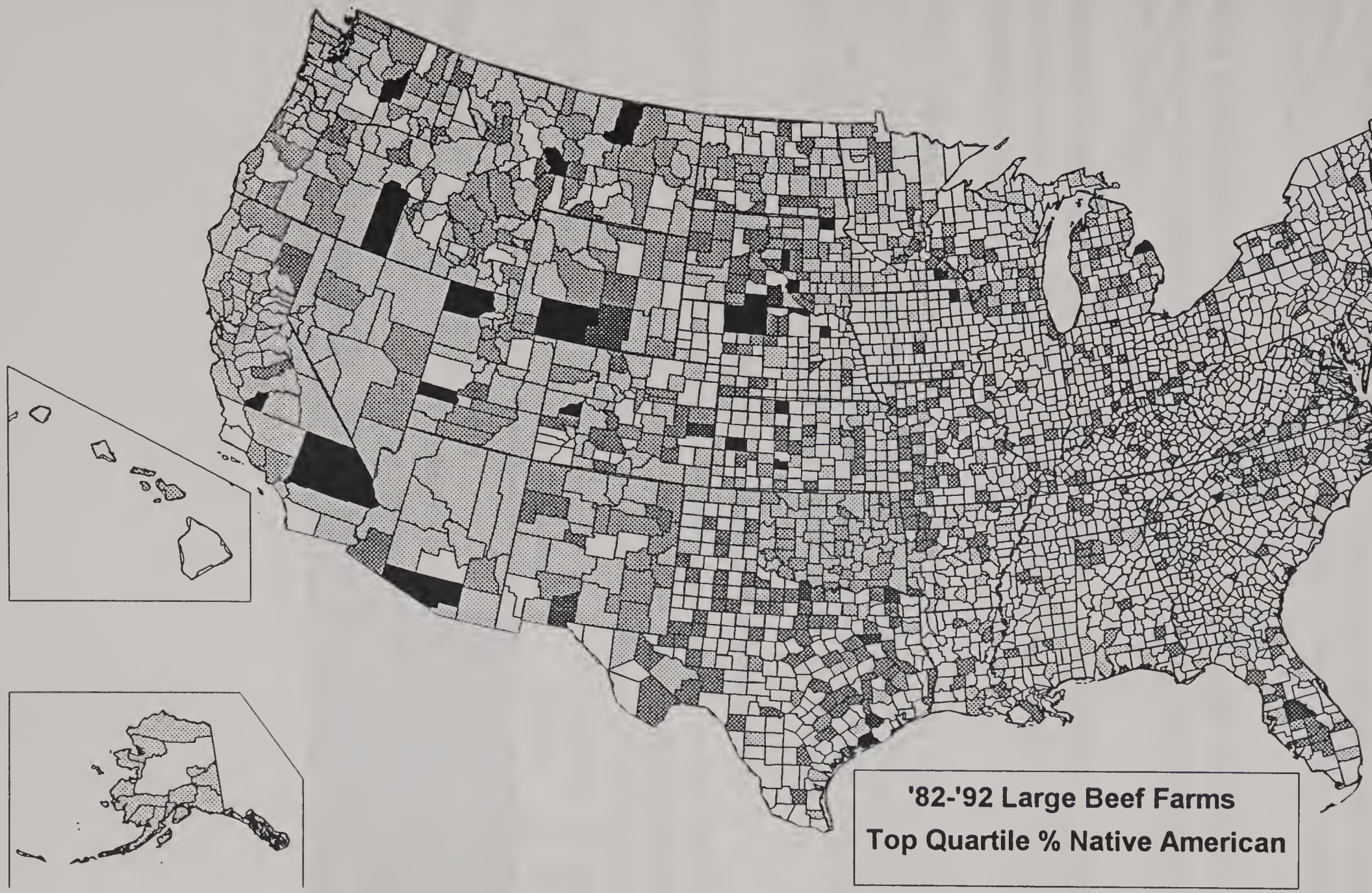
Coincidence Category		Change in Number of Large Beef Units		
		None	1 to ten	11 or more
Socioeconomic	Middle 50%	No Coincidence	Some-Some	Some-Many
Variable	Upper 25%	Many-None	Many-Some	Many-Many


HYDE COUNTY
BRULE COUNTY
SUP COUNTY
PIMA COUNTY
DONA ANA COUNTY
CLAY CO/RED RIVER COUNTY
LOWNDES COUNTY
HENDERSON COUNTY
MATAGORDA COUNTY
'82-'92 Large Beef Farms
Top Quartile % Poverty Families


'82-'92 Large Beef Farms
Top Quartile % '80-'92 Change


'82-'92 Large Beef Farms
Top Quartile % Black


'82-'92 Large Beef Farms
Top Quartile % Hispanic



'82-'92 Large Beef Farms
Top Quartile % Native American

- **Number of Acres in Industrialized Forestry.**

  Poverty. Industrialized forestry coincided with poverty in East Texas, North Florida, Idaho, and one New York county.

  Population Change. Industrialized forestry coincided with population change in Southeastern coastal counties, Idaho. Western Montana, and a few Northeastern counties.

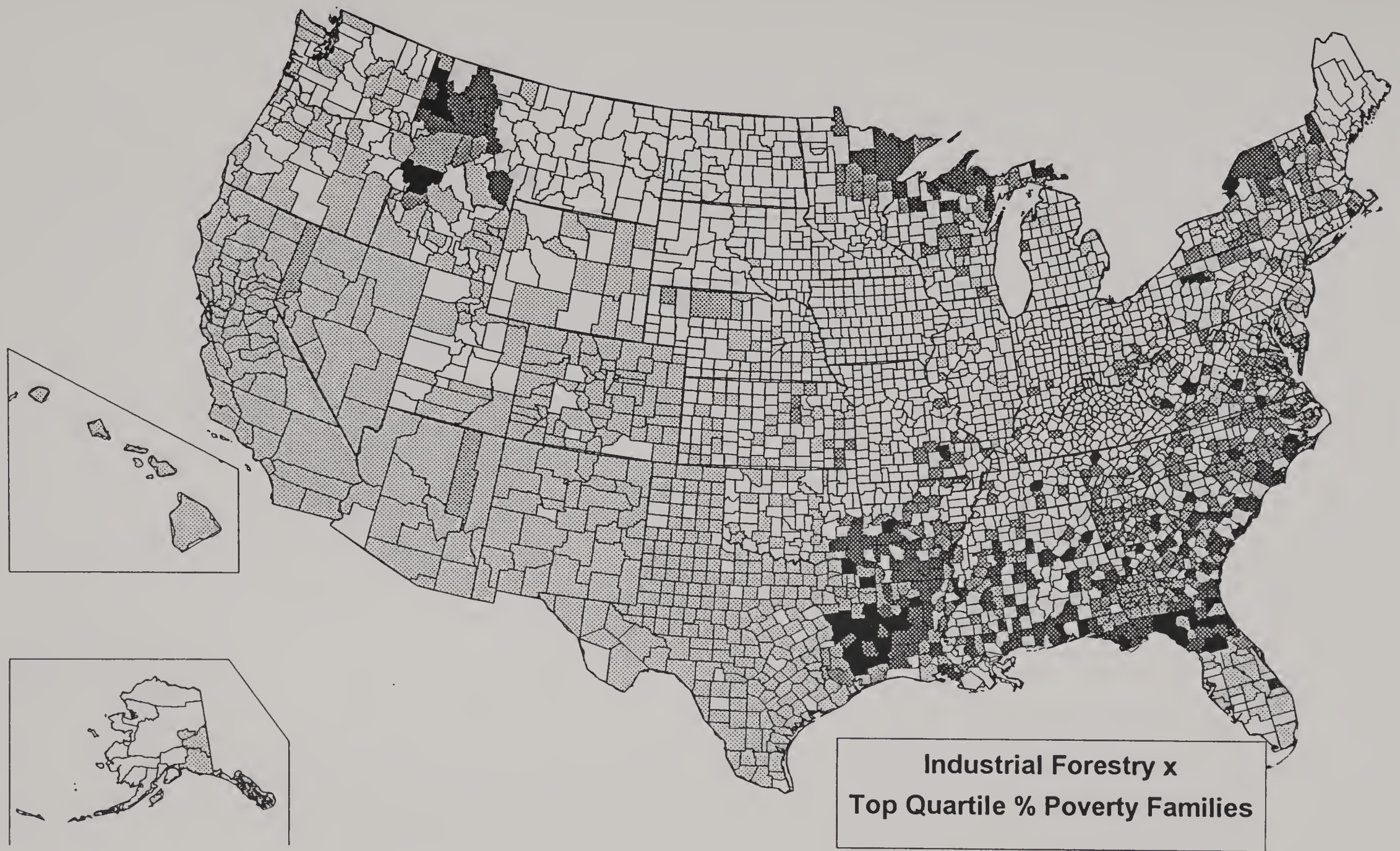
  Black Population. Industrialized forestry coincided with and population in West Alabama, North Florida, and the coastal parts of the Carolinas.

  Hispanic Population. Industrialized forestry coincided with Hispanic population in North Florida, East Texas, some Idaho counties, and isolated counties in the Northeast.

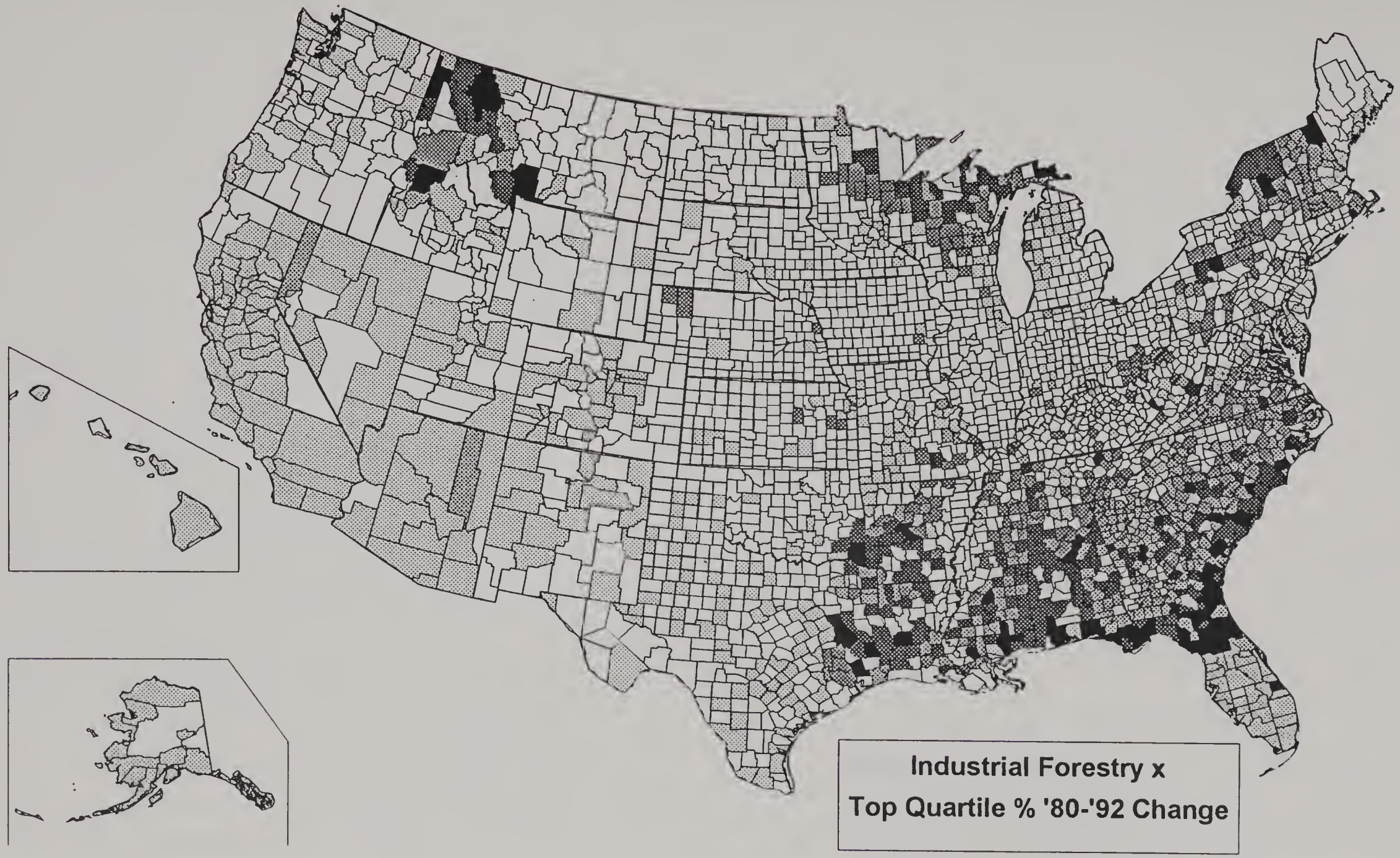
  Native American Population. Industrialized forestry coincided with Native American population in Eastern Oklahoma, Southwest Alabama-North Florida, Idaho-Montana, some parts of Northern Michigan, and some isolated counties in the Northeast.

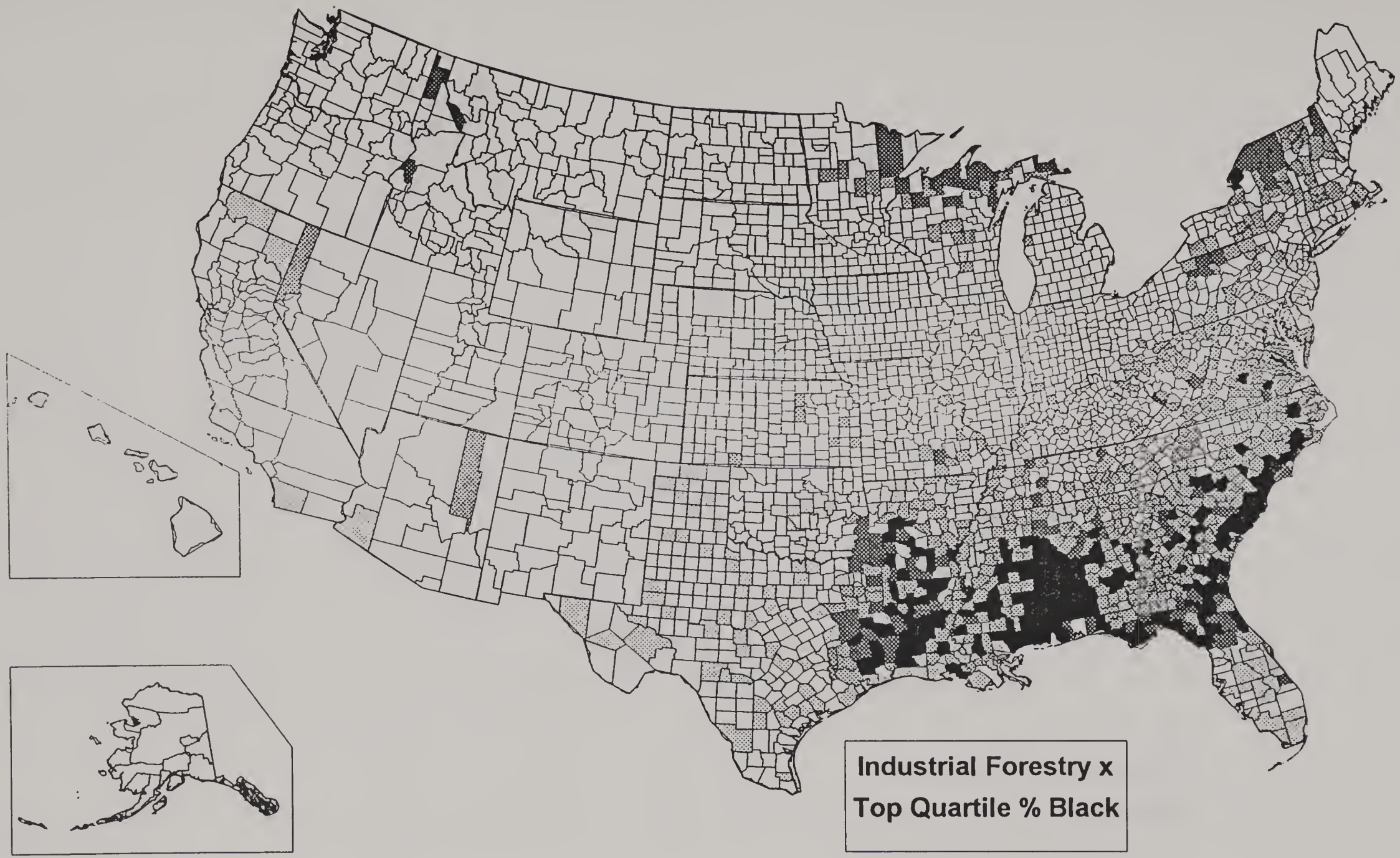
Map Shading for Coincidence Indicators

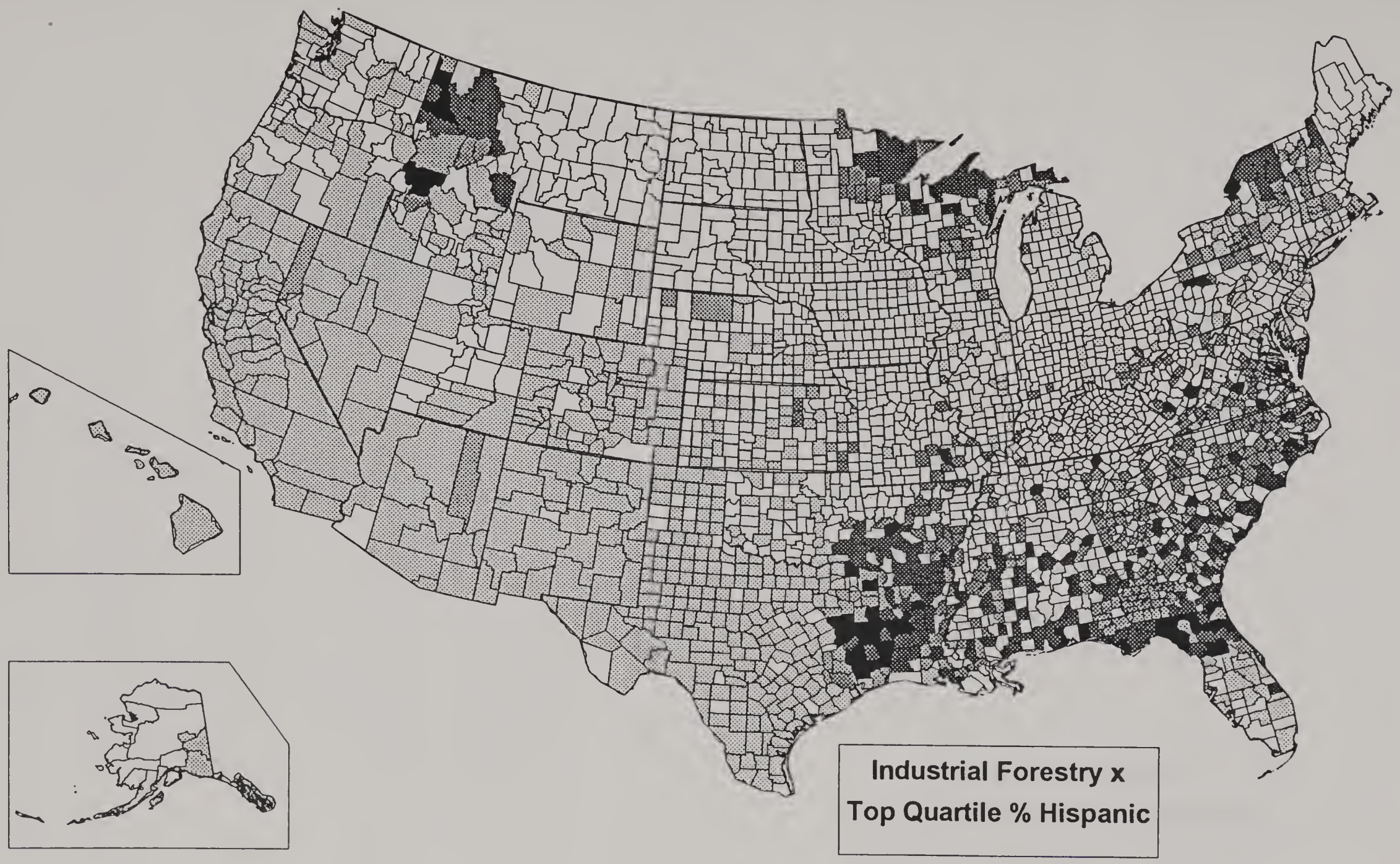
Coincidence Category		Acres of Industrialized Forestry		
		2.1 or fewer acres	2.1 to 53 acres	More than 53 acres
Socioeconomic	Middle 50%	No Coincidence	Some-Some	Some-Many
Variable	Upper 25%	Many-None	Many-Some	Many-Many



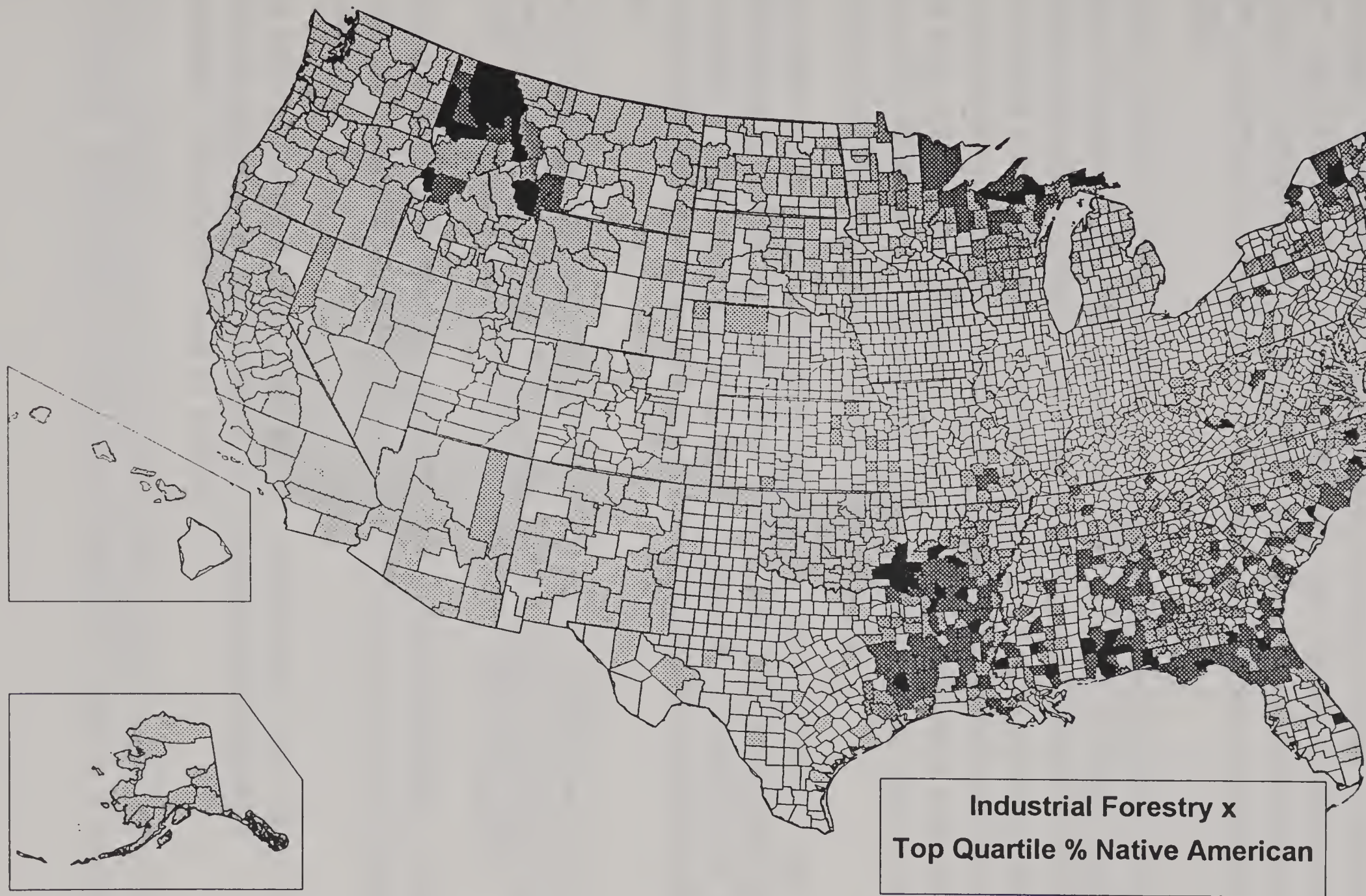
Industrial Forestry x
Top Quartile % Poverty Families


Industrial Forestry x
Top Quartile % '80-'92 Change


Industrial Forestry x
Top Quartile % Black



Industrial Forestry x
Top Quartile % Hispanic



Industrial Forestry x
Top Quartile % Native American

CONCLUSION

This report provides a context for understanding the spatial distribution and impacts of industrialization in animal and forest industries in the United States. Consolidation, vertical integration, and changes in technology have led to the development of larger farm units linked to larger organizational structures. The objective of this study was to portray the spatial distribution of the largest category of farms in a series of animal industries with incidental attention to industrialized forestry.

The hog industry is the most controversial animal industry at the present moment. Large concentrations of animals produce waste disposal and odor problems that often create widespread hostility in surrounding communities. Additional concerns have been raised about the connections between industrialized animal production and the well-being and continued viability of family farms. The maps presented here portray the location of clusters of large scale units as well as where the number of units have grown in the past decade.

The broiler industry continues to expand in the Southeast. The connections between concentrated production and the presence of poor and minority populations tended to be greater in the Southeast. Both the industry and the rural and population tend to be concentrated in this region.

Layer production tends to be concentrated in a smaller set of counties, primarily in the Southeast. The coincidence of layer production and minority populations tends to be less than for other industries.

Turkey production is mainly concentrated in the Southeast. A small number of counties have limited connections to poor and minority populations.

Large beef units tend to be located in the Midwest and West. Counties with more large beef units tended to coincide with Hispanic populations, including those in Florida.

Forestry production tends to be most connected to minority populations in the South, particularly in Southwest Alabama. Native American

populations tend to be linked to forestry in some Western states, Minnesota, and Wisconsin.

The methodology used in this study remains under development. Different classification criteria may lead to somewhat different distributions of coincident counties. The approach employed here, however, does identify the major large-scale production areas across a number of animal and forestry industries. The coincidence of large-scale animal production with poor and minority populations is reflected in patterns that may stem from historical accident, labor needs of the industries, and other factors not determinable from the information presented here. Subsequent research can detail the interactions between growth in large-scale animal production and impacts on poor and minority populations.

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